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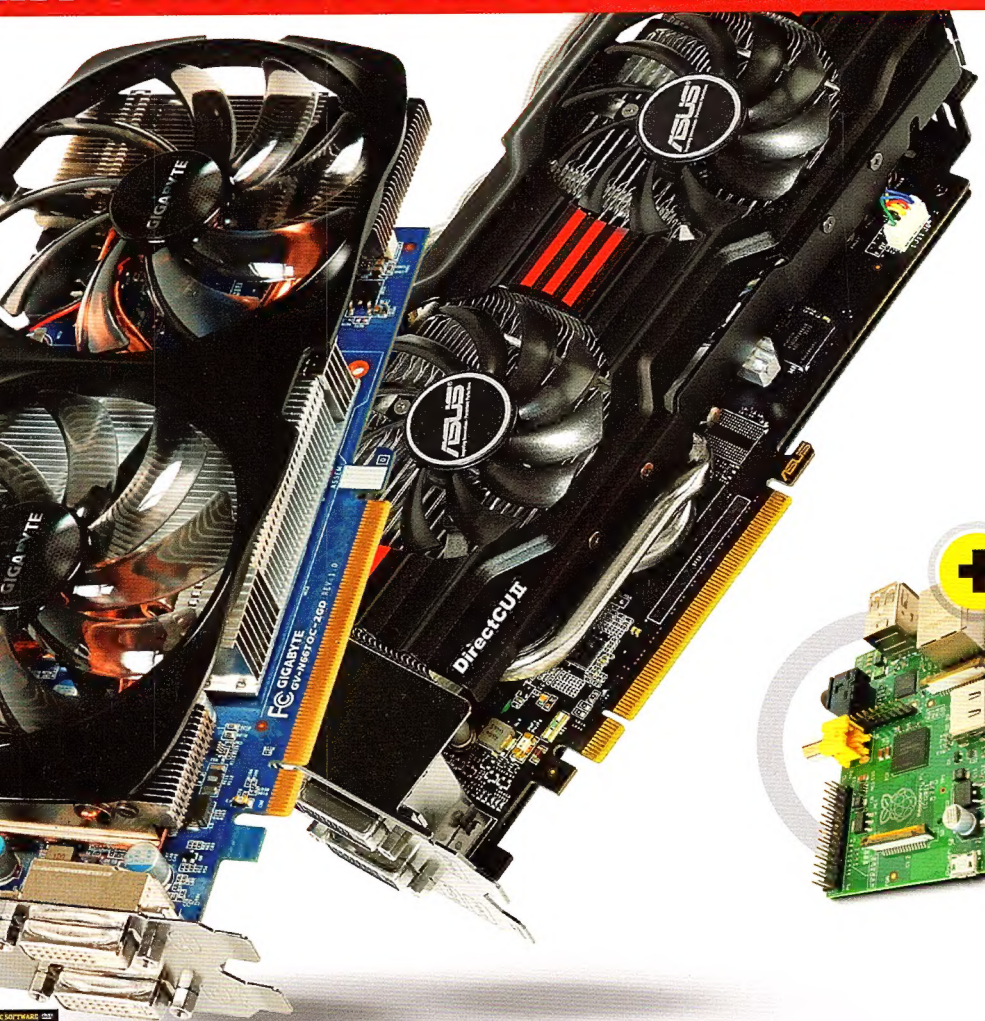

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GAMING CARDS FOR ANY BUDGET

Best gaming cards of 2012 compared

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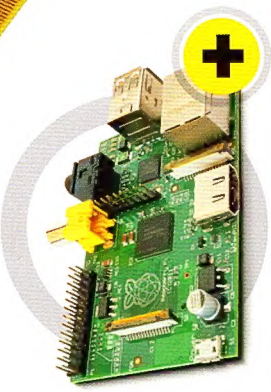
Best new devices for streaming your videos to TV and mobile



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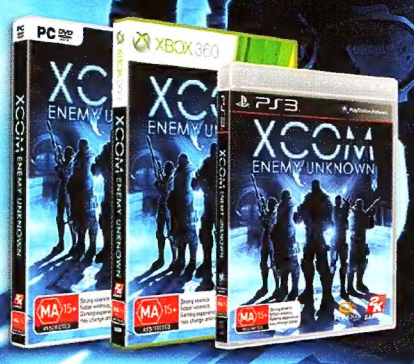

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Time to eject the DVD?

Is it time to replace the venerable DVD with an online software centre?

When *APC* launched its cover disc back in the late '90s, most internet connections were on dialup and all substantial software was distributed on disc. Having a disc attached to the magazine meant readers got a magazine plus a variety of programs they could install on their PC. Most software companies welcomed another opportunity to distribute their software, which was mostly just superseded commercial programs or slightly cut-back versions that would promote their product or let users upgrade to their latest commercial software.

In 2012, times have changed. Fast broadband is here and the optical drive is on the endangered list. It has disappeared from most ultrabooks and is slowly being replaced by downloaded software, Steam and YouTube. Most software companies prefer web-based download distribution systems that also give them a better idea of who their customers are. And that's not to mention the rise of the app stores, particularly the arrival of the Windows Store, which will surely become the home for all Windows software in time (see Ashton Mills's piece on page 78).

We're also discovering that our DVD production staff are spending more and more time testing and rejecting software from companies willing to make it available for a magazine disc, because it's increasingly full of crapware. In other words, the DVD is a medium with diminishing returns for us, taking more and more effort as the pool of software to be distributed through it shrinks.

As an editor, I think the DVD's time is coming to an end and I'd like to replace it with an online software centre that does the following:

- Keeps track of the best apps around the world.
- Keeps providing programs we've secured exclusively from software makers
- Alerts you to the increasingly popular software pricing specials on the web.
- Brings you software not just for the PC but also for Mac and mobile devices.

So why doesn't *APC* just dump the DVD? Because we want to find out from you, the readers, what *you* think first. Is the DVD still important to you? If so, we'll recognise that and redouble efforts to make it better. If you think the time has come to ditch it and replace it with a better, online offering, we want to know.

So I ask you to go to **apcmag.com/dvdpoll** and fill out the short survey. It'll take you no more than five minutes, but it will enable us to make some informed decisions about how we bring you software at *APC*.

Tony Sarno, Editor

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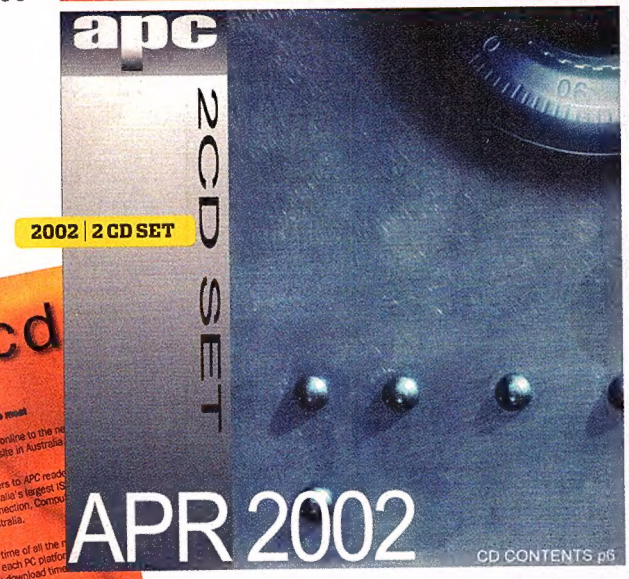

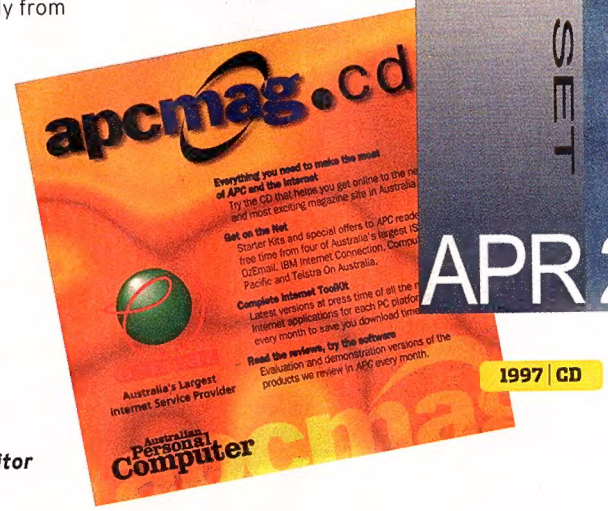
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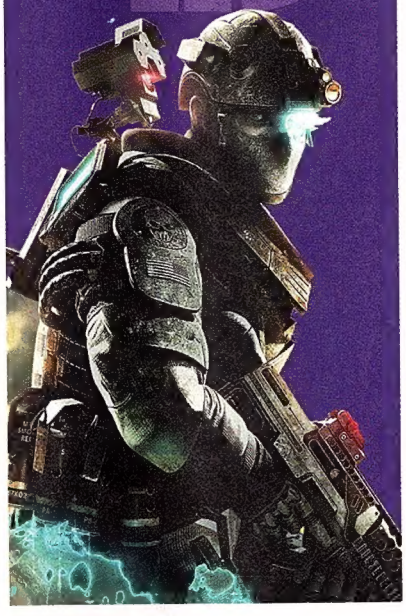

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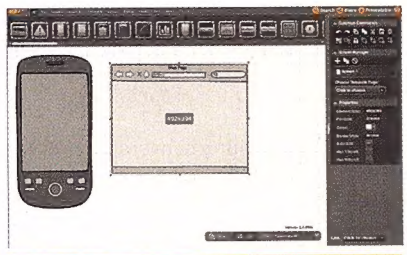

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COMODO ICE DRAGON

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06 editorial

TONY SARNO

I was happy to hear some of the MeeGo engineers have set up their own company...

I had an interesting conversation with a friend who was keen to know what smartphone OS I would recommend. He thought that since I'm constantly sampling products and seeing them perform in the Labs, I'd pick only the best for my own personal use. It made me wonder whether that was really true. Actually it's not. Since I need to understand the various platforms in the market or eat the dog food, as they say, I have five personal mobile phones – based on Android, iPhone, Windows Phone 7, BlackBerry and an indulgence, Meego. I've found that I haven't picked a favourite, but the favourite bits from each. It occurred to me that I use one 'combined' phone made of the best features of all five OS platforms, all of which live in my backpack.

On this 'combined' phone, I constantly use the Google cloud apps on Android, as well as the superior Android versions of Evernote, GTasks and Dropbox. Then I go to the iPhone's iTunes and App Store for music and entertainment. Windows Phone 7 (soon to be Windows Phone 8) kicks in for the day-to-day stuff of phone calls and social media communications because of its delightful UI and brilliant integration of social media and instant messaging with my address book. The BlackBerry Bold is no longer my primary phone because its browser isn't as strong as the others', but it's still my main backup phone because it never breaks, and it has the best battery life and most secure email and instant messaging communications. And finally, the MeeGo-based Nokia N9 is my private indulgence, a kind of sad longing for an innovative phone UI that never was, a totally natural, thumb-driven approach that came just with the Nokia N9 because Nokia then killed MeeGo and aligned with Windows Phone. I was happy to hear some of the MeeGo engineers at Nokia have now set up their own company to develop the OS for the Chinese market.

So what do I connect these phones with? If I were to recommend the ideal mobile plan, it would consist of the Telstra 3G and 4G networks (best speeds, best coverage), and the pricing and customer interface of mobile provider Amaysim, which uses the solid Optus 3G network anyway. I didn't know who Amaysim was until I had to get a prepaid account for my dad (based initially just on research on the best deals), but the company amazed me with the ease and efficiency of its online signup process and app-based account management. If there was a prize for the best company customer interface, Amaysim would get it. These guys saw an opportunity for great customer service in an industry that's not renowned for it and nailed it. That's a radical thought: use customer service as a way to attract customers!

I'd love to hear from readers who've bought products from tech vendors because the customer service was good.

tsarno@acpmagazines.com.au

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EDITORIAL
Editor TONY SARNO *tsarno@acpmagazines.com.au*
Technical Editor DAN GARDINER *dmgardiner@acpmagazines.com.au*
Technical Writer DOMINIK KRUPINKSI *dkrupinksi@acpmagazines.com.au*
Online Editor PETER DOCKRILL *pdockrill@acpmagazines.com.au*
Contributors JOHN ALLSOPP, MARY BRANSCOMBE, SIMON CHESTER, TROY COLEMAN, ALEX KIDMAN, PAUL LAMKIN, MIKE LE VOI, ASHTON MILLS, GRAHAM MORRISON, NICK ODANTZIS, JENNETH ORANTIA, BENNETT RING, MAYNAK SHARMA, NATHAN TAYLOR, JAMES TREVASKIS, STEPHEN WITHERS, DARREN YATES
Notebook Hunter Editor DANIEL CHENG
Editorial & Marketing Coordinator HELEN CHEN *hchen@acpmagazines.com.au*

DESIGN
Art Director DAVID COLLINS
Assistant Art Director TROY COLEMAN
Senior Designer NYKKE COLEMAN
Photography GETTY IMAGES, TROY COLEMAN

PRODUCTION
Production Editor MELANIE PIKE *mjpike@acpmagazines.com.au*
Chief Sub-Editor OLGA JEVDIC *ojevdic@acpmagazines.com.au*
Sub-Editor SABINA COLLINS
Production Controller FIONA OLSSON

MULTIMEDIA
DVD Editor PHILLIP MOORE

ADVERTISING
National Sales Manager FLEUR PORTER
fporter@acpmagazines.com.au (02) 9288 9147
National Advertising Manager KRISTAL RYAN
kryan@acpmagazines.com.au (02) 8116 9356
Advertising co-ordinator JEMMA NICHOLSON
JNicholson@acpmagazines.com.au (02) 9288 9149

MARKETING
Marketing Brand Manager TIM MEDWAY

CONTACTING US
Email *contact@apctest.com*
Web *www.apcmag.com*
Phone (02) 9288 9105 Fax (02) 9267 4909
Postal PO Box 4088, Sydney NSW 2001
Street Level 18, 66 Goulburn Street, Sydney 2000
For opinions you must include your full name, address and B/H contact telephone number, otherwise it cannot be considered for publication.
epinions@acptest.com

REPRINTS AND COPYRIGHT
Contact HELEN CHEN *hchen@acpmagazines.com.au*

SYNDICATION ENQUIRIES
London JOHN SLATER Phone 44 20 7812 6527 Email *jslater@acpuk.com*
Sydney GREG ALLEN-WATERS Phone 612 9282 8808 Email *gallen-waters@acpmagazines.com.au*

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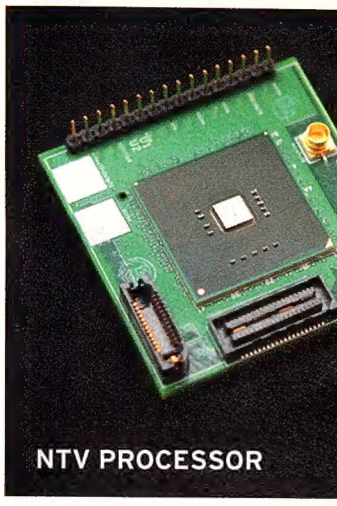

NTV PROCESSOR

HARDWARE

NEW GAME CHANGERS

Do you get the feeling the progress of tech seems to be accelerating exponentially? Here are five more that will make a big impact.

NTV PROCESSOR

WHAT IS IT? A serious x86 processor capable of running at up to 10 times the efficiency of today's CPUs, with power consumption as low as 2mW and the ability to scale from 280mV when running at 3MHz, all the way up to 1.2V at 1GHz.

WHY IS IT IMPORTANT? Improved energy efficiency is vital for the growth of the computing continuum, not just in terms of HPC servers, but also in terms the devices in your pocket.

HOW DOES IT WORK? Back in September 2011, Intel showed off a prototype x86 CPU so low-powered that it could be powered by a solar cell the size of a postage stamp. This was its first introduction of the Claremont platform and its vision for near-threshold voltage (NTV) processors. The threshold voltage is the voltage required for a given transistor to switch into an 'on' state.

Current CPU designs operate at several times the threshold voltage in order to make gains in performance. If you run a processor at close to the threshold voltage, you make significant gains in efficiency – Intel is claiming five to 10 times. Another byproduct of operating this close to the threshold voltage is that the processor can operate at a wide dynamic range of operating frequencies.

SYSTEM ON A CHIP

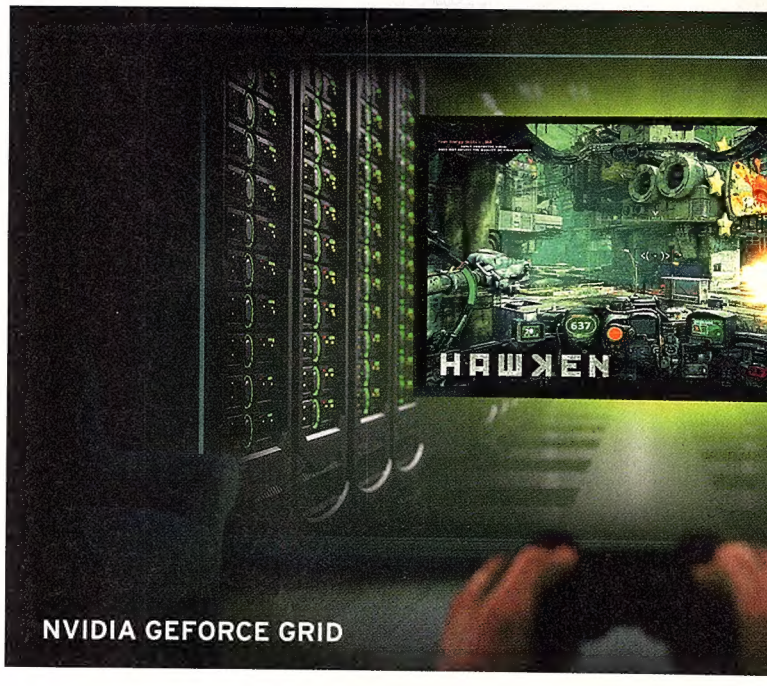
WHAT IS IT? The Holy Grail for chip manufacturers and designers has long been a full computer system shrunk down to fit on a single chip. We've been getting closer and closer, and will soon be closer still.

WHY IS IT IMPORTANT? It's all about energy consumption and efficiency. Instead of having myriad chunks of fixed-function silicon doing different things and only then talking to each other, having a single chip capable of doing everything is far more efficient.

HOW DOES IT WORK? These chips are a fusion of a traditional CPU and GPU, putting both bits of silicon in the same processor die. This is far more efficient than using discrete GPU and CPU silicon, though as yet the performance isn't up there with its separated brethren.

AMD will be the first to use its latest GPU and CPU technology in its upcoming Kaveri platform in 2013 for a real performance APU. Intel has taken a slightly different approach, essentially making its top processors close to system-on-a-chip parts with the Ivy Bridge CPUs. These have an improved DirectX 11 GPU on-die along with the fastest consumer CPU parts around.

The upcoming Haswell parts will include an even greater focus on graphics performance. Nvidia isn't to be left out either, with its forthcoming Project Denver. Nvidia CEO Jen-Hsun Huang promised it will be a serious gamer's chip with a full Nvidia GPU as part of the package.



NVIDIA GEFORCE GRID

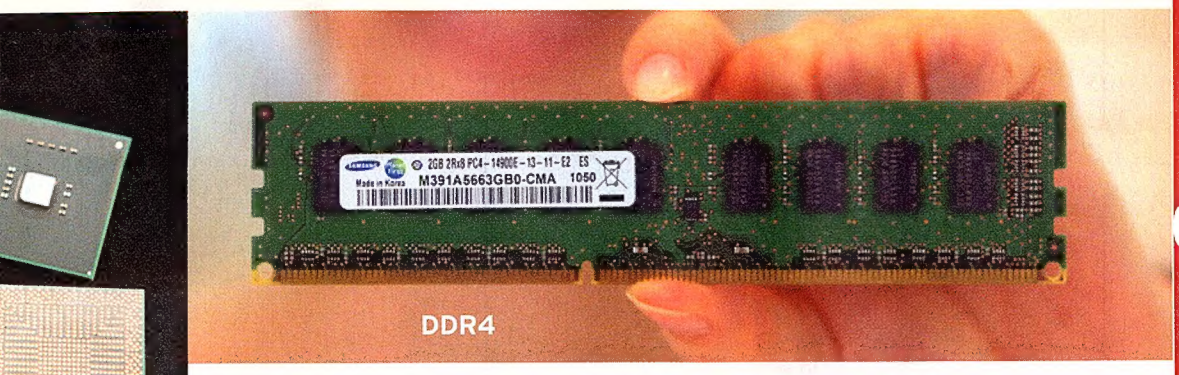
NVIDIA GEFORCE GRID

WHAT IS IT? GeForce GRID is the name given to a new GPU capable of powering game streaming servers with twice the power efficiency of the current crop. It allows the servers to move from one game each to around eight streams per server.

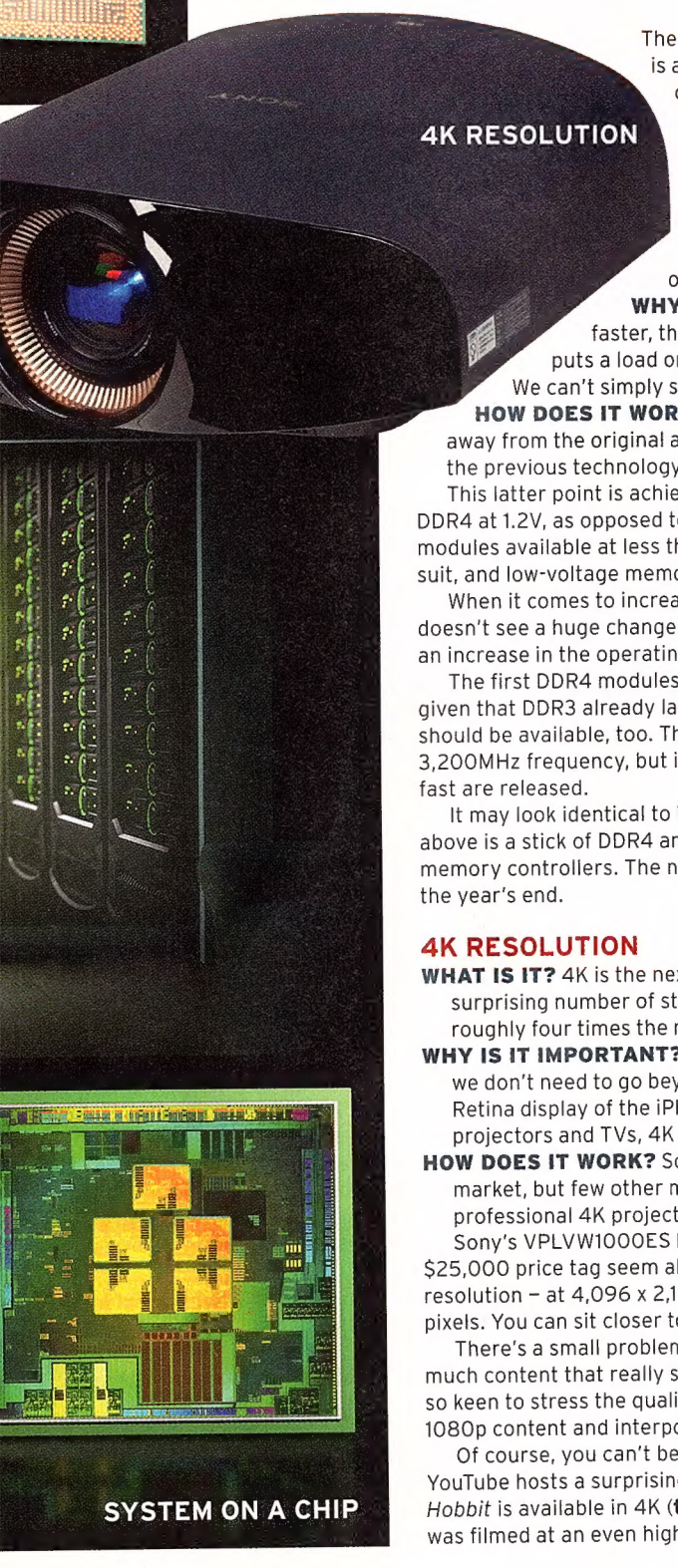
WHY IS IT IMPORTANT? Such efficiency is vital for a growing market like game streaming, which relies on such high-performance and power-hungry servers. It also means the user only needs an H.264 decoder (like a tablet, for example) in order to play full PC games.

HOW DOES IT WORK? Cloud gaming services have been around for a while, but due to weak network structure and twice the latency and lag of a home console experience, they have yet to take off.

One of the main improvements has been the slashing of latency between the user and the back end. One way Nvidia has done this is by shifting the capture and encoding part of the stream onto the GPU itself. That means once the card has finished displaying the frame, it's ready to be fired across the network without having to go anywhere near the CPU.



DDR4



The latency you experience with a home console is around 160ms, with the first generation of cloud gaming services being almost double that. Nvidia says with Gaikai and GeForce GRID, latency will be almost 150ms.

DDR4

WHAT IS IT? The replacement for the existing DDR3 memory standard found in our machines.

WHY IS IT IMPORTANT? As our systems get faster, the amount of data we shift increases, which puts a load on the system buses and memory architecture. We can't simply stick with DDR3 and hope for the best.

HOW DOES IT WORK? The goal for DDR4 isn't a million miles away from the original aim for DDR3 – to improve performance over the previous technology while reducing power requirements.

This latter point is achieved by setting the power requirement for DDR4 at 1.2V, as opposed to DDR3's 1.5V. There are DDR3 memory modules available at less than 1.5V, but DDR4 is expected to follow suit, and low-voltage memory running at 1.05V is likely to appear, too.

When it comes to increasing the performance of DDR4, the spec doesn't see a huge change in the prefetch buffers, instead relying on an increase in the operating frequency to garner speed improvements.

The first DDR4 modules will have a frequency of 1,600MHz, though given that DDR3 already lays claims to such speeds, faster modules should be available, too. The upper limit of the specification defines a 3,200MHz frequency, but it may be a while before modules running this fast are released.

It may look identical to DDR3 memory at first glance, but the photo above is a stick of DDR4 and is therefore incompatible with existing memory controllers. The new standard is expected to be ratified before the year's end.

4K RESOLUTION

WHAT IS IT? 4K is the next step up from 1080p resolution. There are a surprising number of standards fighting for dominance, but they're all roughly four times the resolution of the current HD specification.

WHY IS IT IMPORTANT? For smaller displays you could argue that we don't need to go beyond 1080p (though you only need look at the Retina display of the iPhone 4S for the counter argument), but for projectors and TVs, 4K can produce a much more detailed image.

HOW DOES IT WORK? Sony isn't alone in the super-high-resolution market, but few other manufacturers are currently pushing professional 4K projection alongside home cinema systems.

Sony's VPLVW1000ES boasts the kind of specifications that make its $25,000 price tag seem almost reasonable. The main attraction is the resolution – at 4,096 x 2,160, the final picture is made up of 8.8 million pixels. You can sit closer to the screen without seeing pixelation, too.

There's a small problem for 4K at the moment, though: there isn't much content that really shows off your investment. This is why Sony is so keen to stress the quality of its upscaling engine, which takes your 1080p content and interpolates the pixels up to the higher resolution.

Of course, you can't beat content filmed at this higher resolution and YouTube hosts a surprising number of 4K videos. The trailer for *The Hobbit* is available in 4K (**tinyurl.com/cqdecju**), although the film itself was filmed at an even higher resolution.

TOP 10 FEATURES OF WINDOWS 8

01 FASTER BOOT
Windows 8 boots up to 70% faster because it closes the user session, but not the kernel session when switched off.

02 SECURE BOOT
Blocks malware by preventing unsigned software from starting before Windows 8 boots.

03 WINDOWS STORE
A much, much easier way to access software, with better quality controls.

04 BETTER FILE COPY
Copy now gives you more transfer speed information.

05 RESET PC
Almost like the reset phone function, it completely wipes a Windows 8 installation.

06 CROSS DEVICE SYNC
Through Windows Live, syncs settings and bookmarks across all Windows 8 devices.

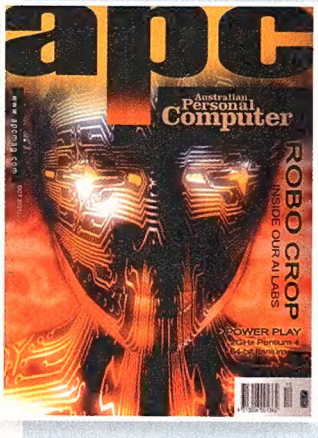
07 WINDOWS TO GO
Creates a locked-down installation of Windows 8 you can run from a thumb drive.

08 TWO LINE NUMBERS
ISO disc images (and virtual hard disks) can run natively, so no need to burn to disc.

09 TASK MANAGER
More detailed – helps you find misbehaving programs and resource hogs more easily.

10 MULTI-MONITOR SUPPORT
Now much easier to set up multiple monitors with your PC.

THE (A)PC REVOLUTION
OCT/2001



GATEWAY CLOSES

Early on the morning that Gateway announces it will no longer sell PCs in Australia, a squad of security guards moves in to secure its 15 stores. Behind the barricaded doors, thousands of dollars' worth of unsold PCs speak of Gateway's Australian failure. Over the past years, Gateway had spent millions on marketing, yet never won over Australian buyers.

A STINGER IN THE TAIL

Telstra has begun local trials of 'smart phones' that run Windows CE on a combined phone and handheld device, and browse the web, download software and use Windows applications. "This is a quantum change in merging the Windows environment with the phone," said Paul Schofield, from Telstra's international strategy and development group, adding: "imagine a phone with an enlarged colour screen that works as a communications device for downloading software and different media, and access applications using voice recognition."

(Editor: Telstra was describing what is, in effect, the iPhone!)

LAPTOP

DELL IS BACK WITH A BANG

Dell's new XPS range of laptops impresses, particularly its MacBook Pro lookalike, the XPS 15.

Dell has given its laptop range a huge 2012 refresh, which includes the new flagship Dell XPS 15. It packs an incredible hardware configuration inside a great-looking chassis, creating a kind of MacBook Pro of the Windows world.

It's expensive – this particular model is $1,799 – but there's plenty of technology inside to get excited about, including an Ivy Bridge i7 chip, discrete graphics courtesy of Nvidia, an SSD, a big 1TB HDD, 8GB of RAM and a beautiful Full HD display. If you've looked enviously at MacBook Pros in the past, this is a pretty good alternative.

At 23.2mm thick, the XPS 15 looks ever so slightly chunky through our ultrabook-tinted glasses, but you have to remember that this machine is more MacBook Pro than MacBook Air. With a weight of around 2.6kg, it's hardly a monster of a laptop that will leave you tied to your desk all day.

The chip powering the show is a third-generation Intel Core i7-3612QM quad-core CPU clocked at 2.1GHz. The XPS 15 also houses an Nvidia GeForce GT 640M GPU, which provides an extra 2GB of VRAM and allows you to boost your laptop's graphical performance up to four times its usual pace. That makes it ideal for heavy-duty tasks like games and video editing.

In essence, the XPS 15 specialises in hammering through the most intensive of your daily digital demands, from watching high-definition movies to say, rendering 3D objects in something like DAZ Studio. And you'll have plenty of space to store all of the digital media that it's capable of bashing through, thanks to that 1TB HDD.

This generous hard drive is paired with a more modern 32GB SATA SSD, which translates to super-quick Windows boot times that will get you going in no time.

Using the Dell XPS 15 is an incredibly comfortable affair, thanks to the island-style keyboard and slick glass Synaptics touchpad. The keyboard is backlit, with a very shallow travel and a pleasant springiness hidden behind every stroke. The touchpad supports multitouch gestures to speed up your workflow and navigation is smooth.

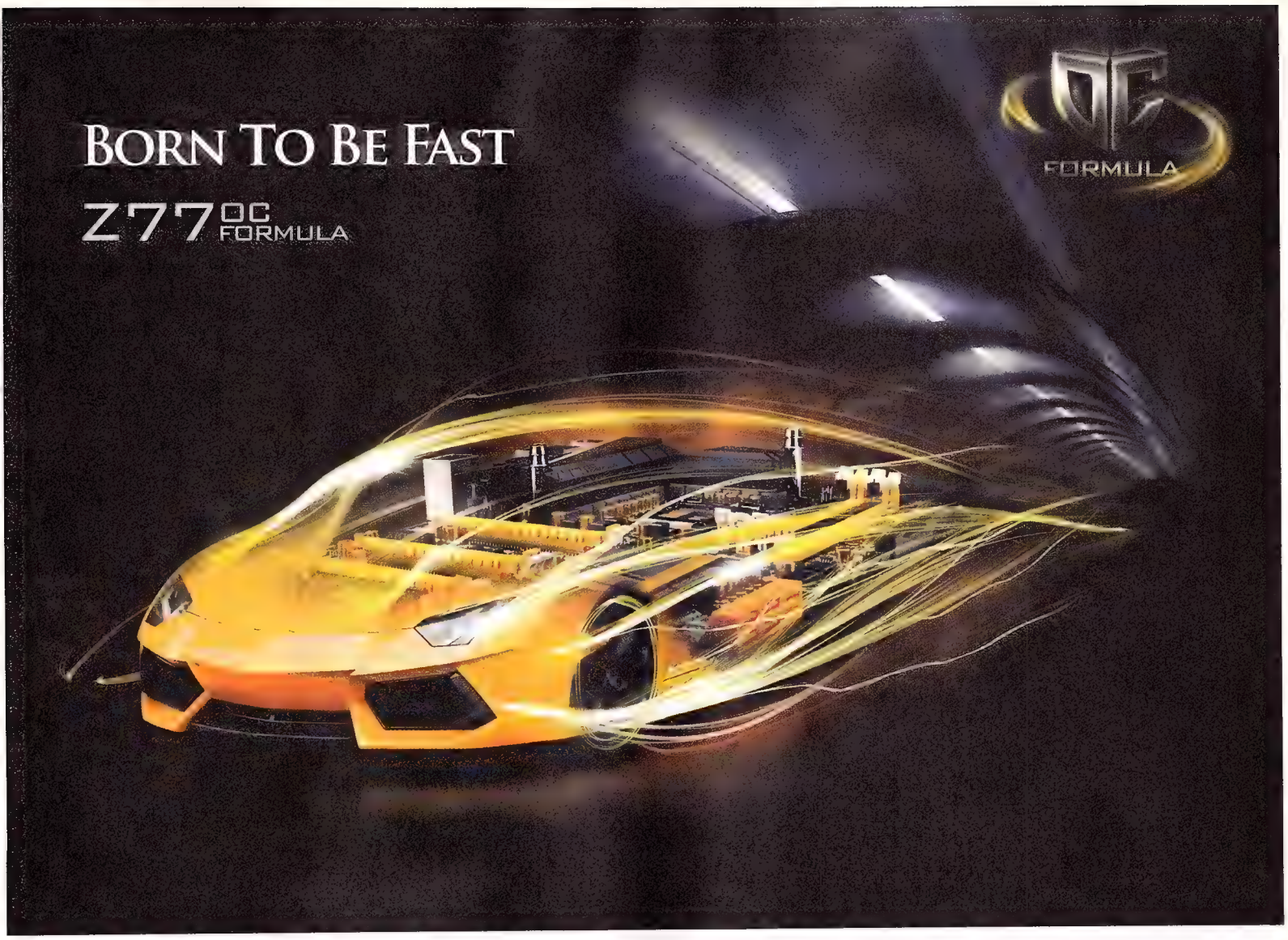
This laptop features a non-removable battery, which Dell says will last up to eight hours per charge. During our stress test it managed just 3:15hr, indicating a lifespan of around six hours for everyday use. That's still pretty good for a powerful laptop – most ultrabooks don't last that long.

If you're looking for a high-end laptop that marries good looks and superb performance, the Dell XPS 15 is a good bet.

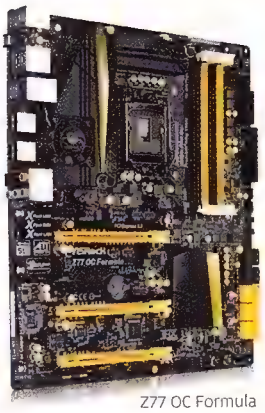
Paul Lamkin

BORN TO BE FAST

Z77 OC FORMULA



- DIGI POWER DESIGN
- DUAL-STACK MOSFET
- PREMIUM ALLOY CHOKE
- MULTIPLE FILTER CAP
- TWIN-POWER COOLING HEATSINK
- 8 LAYER PCB, 4 X 2OZ COPPER



Z77 OC Formula

Designed by World Overclocking Champion, Nick Shih

Nick Shih

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Megaware Computer	02 9698 1593	megaware.com.au
MSY	02 9755 0668	msy.com.au
Mwave	02 9649 5187	mwave.com.au
Nexcom	02 9642 8068	dcomp.com.au
North Shore Computers	02 9939 1548	nscom.com.au
PC Lan	02 9649 3288	pclan.com.au
PC Meal	02 9746 7886	pcmeal.com.au

QLD		
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Compuworld	07 3100 7100	www.cw.com.au
Game Dude	07 3387 1500	gamedude.com.au
LDS	07 3870 8333	www.lds-it.com.au
MSY	07 3290 1738	msy.com.au
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MATS Systems	08 8186 2110	mats-systems.com.au

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Netway Computers	08 9332 0888	netwaycomputers.com
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www.asrock.com

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12 gadgets

BY ANNA RACITI

Microsoft Wedge Touch Mouse

Small in size and Bluetooth enabled (so there's no wireless receiver to plug in), this industrial-looking wedge-shaped mouse makes a good companion for Windows and Android tablets. With mobility in mind, the mouse is made to work on a wide range of surfaces, so pant legs, car seats and airport floors can now double as desk space. It also incorporates Microsoft's new touch strip for a convenient and amusing way to scroll. You can scroll vertically and horizontally with a flick of your finger, using the speed of your stroke to control how fast or slow you go.

ONLINE www.microsoft.com.au

US$70

$200

Panasonic KX-TG8563AZB

Here's something we've never seen before: a cordless phone that doubles as a baby monitor. You place one handset in the baby's room and if the baby cries, you can listen in using one of the other handsets. You can even have the phone call a preset external line (your mobile phone, for example) if the baby wakes up. Another big selling point is that it keeps functioning during a blackout. You can use the power stored in your handset to charge the base unit, allowing you to make and receive calls in an emergency.

ONLINE www.panasonic.com.au

$399

Samsung DA-E650

This shiny, brown, boomerang-y horn-shaped thing may not be everyone's idea of a beautiful audio device, but it marks a moment of harmony between two warring factions – it's a dual docking device, so it will love your Android or iPhone equally. On the inside, you get high-end sound features such as glass fibre speakers for enhanced audio clarity. The unit has a USB port, so you can play music directly from a USB key, or you can opt for wireless music playback thanks to built-in Bluetooth.

ONLINE www.samsung.com/au

$150

16GB: $49
32GB: $89

LaCie RuggedKey

If Chuck Norris used a USB key, it would be the RuggedKey. This bright orange tube of toughness can withstand being dropped off a cliff, thrown into a piranha-filled river or frozen in Antarctic ice – just like Chuck Norris. Not only is the key 100m drop-resistant, heat, cold, dust and water-resistant, it also supports USB 3.0 speeds for super-fast data transfer. But the robust resilience doesn't stop there; it also protects data from unauthorised use with AES 256-bit encryption. Chuck would be so proud.

ONLINE www.lacie.com/au

Logitech Wireless Solar Keyboard K750

We love solar-powered devices, especially when they're capable of charging in any kind of light. The K750 will charge in sunlight or even in indoor lamp lighting, and once charged it can stay charged for months, even when tucked away in a cupboard. I wish the rest of my mobile devices were the same. The keyboard is less than a centimetre thick, so it's not a hassle to carry around. Another smart feature is the special 'Unifying' receiver. Slip it into your notebook or tablet's USB slot and it will work for multiple compatible devices, without the need for another dongle.

ONLINE www.logitech.com/au

FEATURE

OFFICE 2013

Mary Branscombe goes indepth with the Technical Preview.

The next version of Microsoft Office has been given the Metro treatment, with a touch-friendly interface, as well as new features. It's also gone to the cloud, with subscription prices, on-demand installation, and automatic syncing of settings and documents saved on Microsoft's servers.

Although the preview suite is called Office 15, individual applications such as Word and Excel get the 2013 tag, so we expect that the final release will be called Office 2013.

There are Office 2013 versions of the Exchange, SharePoint, Project and Lync servers as well. Businesses can either run these in-house or use the cloud versions through the Microsoft-run Office 365 service, or from the usual mix of hosting companies.

You will still be able to buy Office 2013 as a traditional software licence that you pay for in full in advance, but you can also choose to buy it as a subscription through Office 365. That gets you the full desktop and Metro applications, not just the Office web apps (which also get an update), plus Office for Mac and for any other devices for which Office applications are available (like OneNote for iOS and Android devices, for example).

OFFICE IN THE CLOUD

There are four plans available: Office 365 Home Premium, Office 365 Small Business Premium, Office 365 and Office 365 Enterprise. You don't have to download and save a large installer for any of these; when you start the download from the Office 365 web site or try to open an Office document on a PC without Office installed, the apps stream from the cloud. This uses a much-improved version of the Click-to-Run virtualisation that Microsoft currently employs for the Office 2013 trial versions. It enables you to start using the applications just a few minutes after you download them.

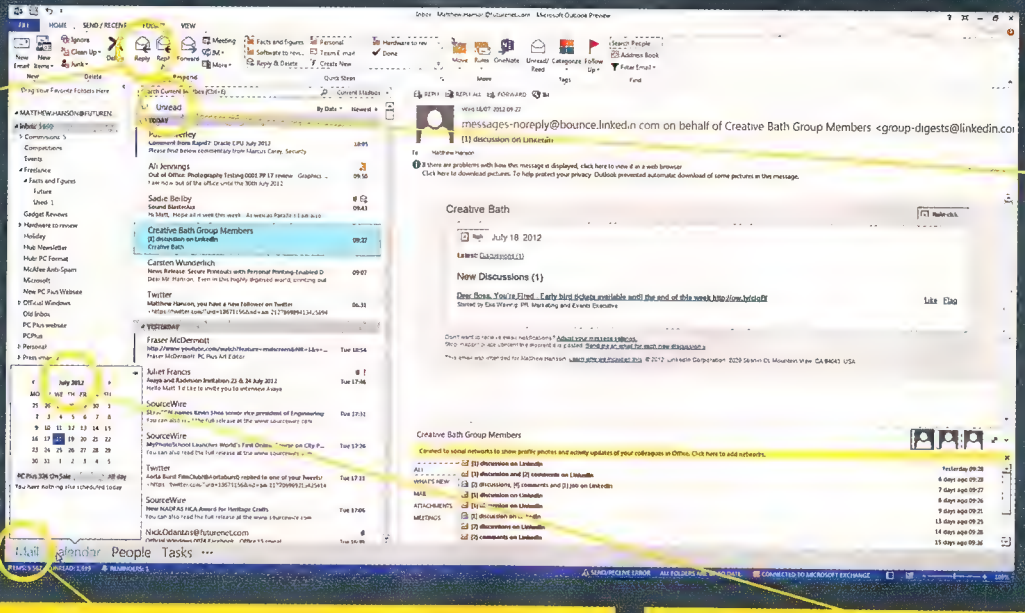
A slideshow of new features opens in PowerPoint while the other applications are streaming, and you can pick options like the design you want to see in the Ribbon.

INTERFACE TWEAKS

Office 2013 takes the clean principles of Metro and applies them to desktop apps. This puts your documents centre stage, with tools like the Ribbon fading slightly into the background. The Ribbon looks much more spacious, but takes up no extra space on the screen. Word gets a new 'Design' tab on its Ribbon, which is a more logical place for the formatting and page background tools previously found on the 'Page layout' tab.

The layout features are also greatly improved. You can now embed videos directly into Word documents and have them play, and search your Facebook and Flickr accounts for photos, which can be placed in documents

QUICK REPLIES

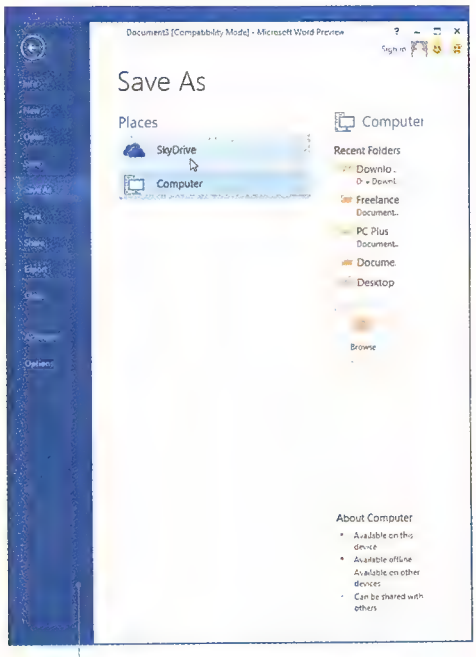


QUICK REPLIES
Reply to an email using the button at the top of the message and you're typing in the main Outlook window, above the message you were reading. You can pop it out into a separate window if you need to, but this is a clean way of working.

EMAIL MANAGEMENT
Fans of Windows Phone will be delighted to see the 'All' and 'Unread' buttons in the inbox. You can quickly jump between all your messages and just the ones you need to deal with.

EASY ACCESS
On the bottom of the screen are four words: 'Mail', 'Calendar', 'People' and 'Tasks'. Hovering your mouse over 'Calendar' pops up your calendar, hovering over 'People' pops up a list of your favourite contacts, while hovering over 'Tasks' pops up your to-do list. Clicking on each one takes you to the full page where you can work with each category in greater depth.

WEATHER FORECAST
Click on 'Calendar' and you'll see a three-day weather forecast at the top of the screen (as long as you're online). Microsoft tells us this will pick up the location of your appointments and show the weather for the right city if you're travelling.



Saving to the cloud-based SkyDrive service is now integrated so tightly that it's as easy as saving to a normal hard drive.

without being saved locally first. These are well-designed tools that are easy to use.

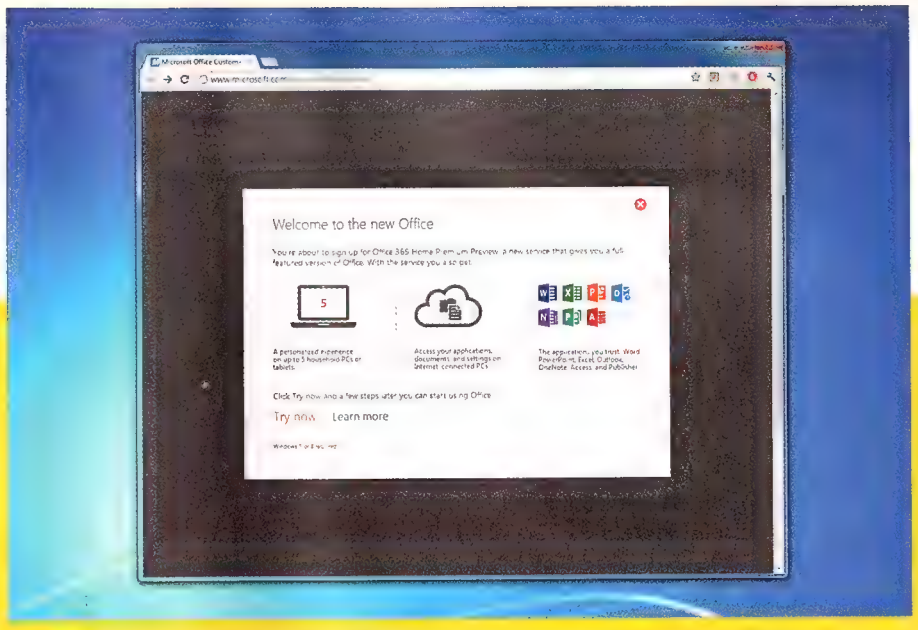
The improved layout options may be why the new PDF reflow feature works so well. This opens PDFs as if they're Word files, converting the layout so you get a Word document that looks like the original PDF, complete with fonts, layout, images, tables, charts and page numbers, and making it all editable. This is fast (converting a two-page PDF takes only a few seconds longer than opening it in Adobe Reader) and is remarkably accurate.

Another new option, 'Read Mode', removes nearly all of the interface, reflowing documents to fit on screen with thumb-friendly buttons on either side of the page on your tablet.

But cleaning up the interface means losing some useful tools. For example, the handle you can drag to divide a Word document window into two scrolling panes (so you can see two sections at once) has disappeared, relegated to a button on the 'View' tab, so it takes twice as many clicks to get the split view.

Excel gets the same interface changes as the rest of Office. It also has some of the same new tools and, like Word, offers more help for existing features. For example, when you select a range of cells containing numbers, the Quick Analysis tool will pop up next to the selection with a gallery of conditional formatting, the charts that show the most information from that specific data, formulas, table formats and in-cell sparklines. Hover over an option and you'll see it either in your data or as a pop-up.

Error messages are also more useful. Drag a cell across the worksheet when you meant to click somewhere else and Excel will give you an informative warning that there's already data in that cell.



Download the Technical Preview today and you can give Microsoft valuable feedback that will help make the final release even better.

HOW TO TRY THE NEW OFFICE TODAY

If you're keen to try out Office 2013 right now, you can download the Technical Preview (Office 15) for free. The Technical Preview is much like the Consumer Preview of Windows 8 – the product is almost finished, but Microsoft is keen for people to try it out, so that it can gauge reactions to the new features. Two small icons (a smiley face and a sad face) are present in most windows. If you like something, click the smiley face; if you don't, click the sad face. It's a quick and simple way to show Microsoft what you think. The more of us who use this feature, the better idea Microsoft will get of what works.

We didn't have too many problems when using Office 15 Technical Preview, but as it's a pre-release, there'll be bugs and some instability. This means it might not be a good idea to work on important documents, just in case. If an error does appear, you'll be asked to send a report on what went wrong to Microsoft. Again, this is a quick process and can help identify any bugs before Office 15 gets released.

To get started go to **www.microsoft.com/office/preview/en**. Click 'Sign up > Try now' and log in with your Windows Live ID. If you haven't registered with Windows Live yet, you can sign up for a free account from this page. On the next page you'll see a big green 'Install' button. You can install Office 15 Technical Preview on up to five different devices. Clicking 'Install' will install the 32-bit version of Office 15. If you want to install the 64-bit version, click the 'Language and install options' link and make your selection there.

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TOUCH READY

Office 2013 is designed to showcase Windows 8 and its touch features. Even the desktop apps are ready for touch. Press the 'Touch Mode' button on the Quick Address Toolbar and the layout of the interface changes, taking away some of the detailed commands and giving you more space to tap buttons.

In Outlook it also brings up a bar of five frequently used commands ('Reply', 'Delete', 'Move to Folder', 'Flag' and 'Mark as Unread'). These appear where your fingers are if you're holding the tablet in landscape orientation. There are some great touches, too, like using pinch-to-zoom in the calendar to move between day, week and month views.

Outlook has other handy ways of enabling you to work right where you are. Reply to an email using the button at the top of the message and you're typing in the main Outlook window, above the message you were reading; you can pop it out into a separate window if you need to, but this is a clean way of working.

On the other hand, Outlook is where the chunky Windows 8 notifications are the most intrusive – you get one for every new mail and they stack from the top-right of the screen down, rather than staying in the same place.

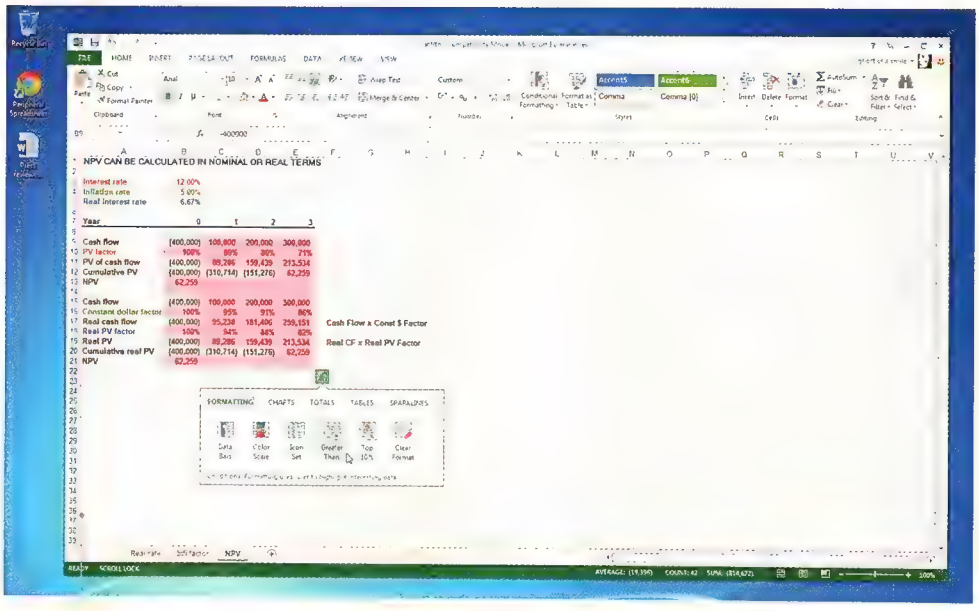
POWERFUL APPS

With any new version of Office, the first thing that always springs to mind is whether there's anything new that Microsoft can add to such a mature and powerful productivity package.

For example, Word has been accumulating tools for 20 years, and the ability to insert videos and online images is more a matter of catching up with the times than a major new feature. However, PDF flow and the massive improvements in tracking changes and comments in documents are hugely useful.

All the key Office apps have new features that are well implemented and worth having. Best of all, the switch to subscription pricing means the days of asking whether it's worth upgrading for a specific feature are over. When something new comes along, you'll get it for the same price.

New additions range from little touches like animated calculations in Excel, to new tools that help you create a chart that shows what's important in your data. You get in-place replies in Outlook, and you can now change tracking and commenting in Word without turning your document into a battlefield.



The Quick Analysis tool in Excel 2013 makes quick work of applying conditional formatting to your cells.

We like the new tools for designing presentations in PowerPoint, but we like the new presenter tools even more. Whether you make slideshows or just sit through them, PowerPoint 2013 should make your life better.

OneNote Metro is the first real Metro application and defies arguments that Metro is only good for toy apps and games. It's a powerful piece of software that has most of the key features of the desktop version, and shows what you can achieve in the Metro interface with the WinRT framework. If you switch PCs often, you'll love the fast streaming install.

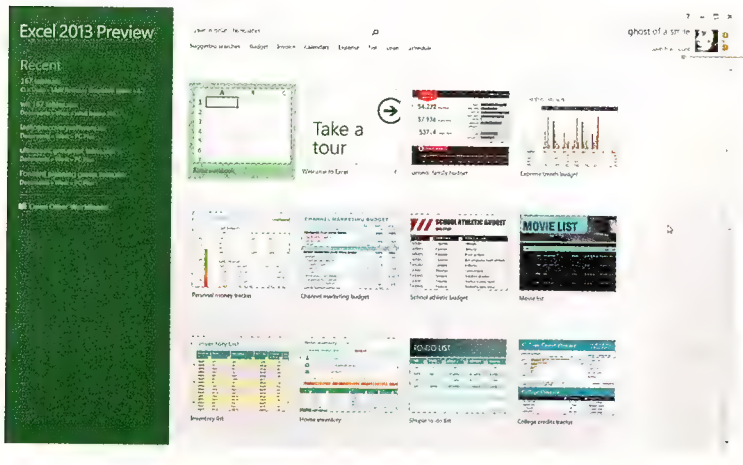
However, sometimes cleaning up for Metro means dumbing down. Advanced features like split view and AutoCorrect are now harder to use, which is a step backwards, not forwards, and is at odds with the way other powerful features like Pivot Charts are exposed.

We had few problems with performance or reliability, but an incompatibility with SharePoint 2010-hosted sites stopped Outlook from syncing mail until we removed the SharePoint connection. As always, though, pre-release software isn't necessarily up to full-time use.

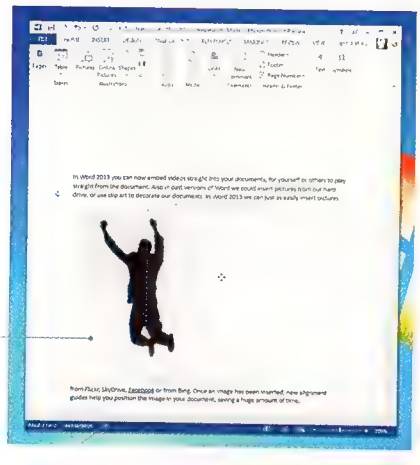
If you look at a list of the new features in Office 2013, you might not see any one you can't live without, but after even a few days of using the new applications, there are plenty you'll appreciate. This is another big advance in usability, combined with some extremely clever new tools.

There are plenty of new additions for power users, especially in Excel and PowerPoint, and there are features that either make it easier to use the power of existing tools, or give you new ways to achieve what you're trying to do. We'd like to see more true Metro apps, though – a version of Outlook that you can search from Metro and keep up to date during 'Connected Standby' should be high on the agenda.

For the most part, Office 2013 strikes the right balance between streamlining and oversimplifying. There are some occasions when we missed specific power user options, but the great thing about a subscription service is that you won't have to wait so long for improvements. APC



As with previous versions of Excel, there are plenty of useful templates on offer. The new start screen gives you a good overview.



The new guidelines added to Word 2013 makes it quick and easy to position clip art and other images, including photos from Facebook.

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HAVE YOUR SAY

RASPBERRY POWER

The flexibility and capability of single-board computers is nothing to be sneezed at.

Where do I begin? I was completely unaware of just how powerful the Raspberry Pi is and am completely blown away by the MK802 devices! I was hanging out for a manufacturer release of an Android mobile phone with Ubuntu installed alongside. I was sure that Ubuntu on Android was the future of computing (and may well still be).

But now, I may let that idea go and grab an MK802 device. How merry will it be to be able to work on documents at work, home or anywhere with a suitable screen and input device. No need to upload documents to the cloud and no need to be syncing files to and from USB drives. Power up and go!

Sure, it's no Core i7, but for the basic day-to-day jobs, simple flyers, spreadsheets and letters, it is ideal. And all without shelling out huge money for a fragile phone.

I sincerely thank you for introducing me to the beauty of these devices, and congratulate and thank Darren Yates for allowing us to have access to APC piLinux for Raspberry Pi. Outstanding.

Matthew Cleggett** | **From the internet

MARKET FORCES

Congratulations to *APC* for the campaign drawing attention to Aussies being ripped off in the international marketplace. I was in the market for a Wi-Fi range extender and I checked out online, finding prices around $85 plus $16 delivery.

National retailer Officeworks promotes 'Big ideas, lowest prices'. With some cynicism I had a look at its pricing policy online and then I tried it out in person. From my search I identified an online supplier I'd used before, selected the product, entered my postcode and printed the page. I took the evidence to a local Officeworks store and requested price matching for my chosen product. No fuss, I wasn't treated like a nerdy leper, a wait of a few minutes and after their online price check, I was offered the product at a 5% discount to the other supplier's online price.

I paid $95.46 rather than Officeworks' on-the-shelf price of $144. My experience saved me nearly $50 in comparison to a walk-in customer and I have the advantage that if the product had been faulty out of the box, I could have returned it for immediate replacement, rather than repacking and mailing it for replacement. This transaction was a win-win!

Phil W** | **Wallsend NSW

PRICE CANCELLING

Great magazine. Regarding the pricing of products OS, I've been looking for some noise-cancelling headphones and on the Bose site in Australia, its QuietComfort 15s are $399. In the US they're $299. Today the exchange rate is $1.04. Go figure!

Matt** | **From the internet

POWER UP USB KEYS

I'm writing this in response to Mark Green's 'epinion' in the September issue titled 'USB key better than the cloud'. I'd have to agree with Mark about the usefulness of USB keys in some of the environments we work in. As a response to his liking of the U3 (a method of launching Windows applications from USB drives) that used to come with some USB keys, there are portable apps I'd like to bring to Mark's attention at **portableapps.com**. You can make your own custom, take-anywhere key similar to U3 and load mail clients like Thunderbird, utilities like 7-Zip and image software like GIMP and Inkscape. There are hex editors and OpenOffice, internet browsers, Telnet clients and so on. All of these can be installed from the menu after you set up your portable app key – better than the U3, which installed a driver on your PC.

Steve Watts** | **Queanbeyan NSW

APC CHANGES

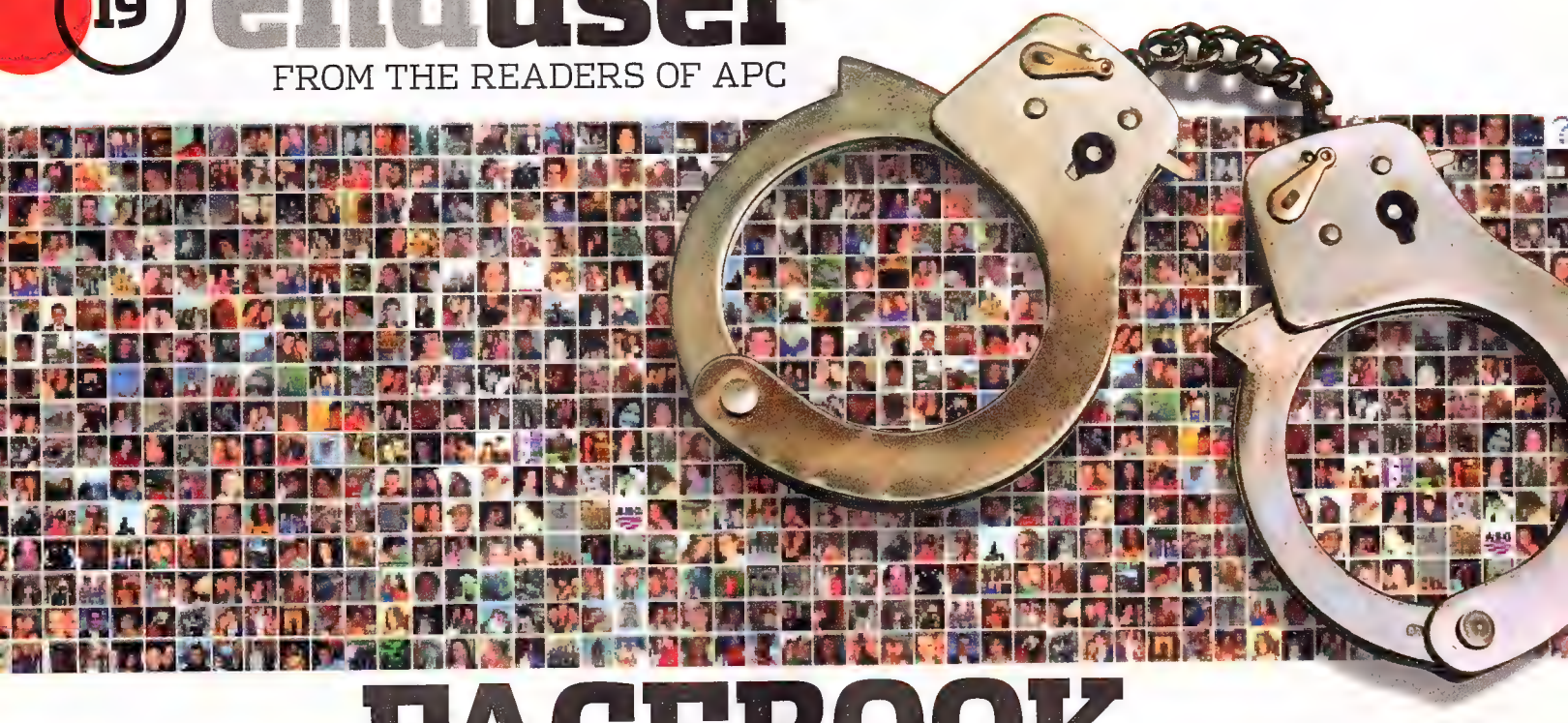
I just thought let you all know how much I enjoyed reading the September magazine. I love the layout and reviews on CPUs and motherboards. It's such a terrific read. Thanks for such a great magazine.

Andrew Golsworthy** | **From the internet

EPINIONS@APCTEST.COM

Come on, have your say!

We want to hear what you think. Add to these discussions or email your views (in fewer than 250 words) to epinions@apctest.com. All correspondence becomes the property of APC and is subject to editing. Letters must include full name, street address, suburb, state and phone number to be considered for print publication. Address and phone details will not be published.



FACEBOOK

It must be said — Facebook has become the ultimate stage for dumb end users.

'End user' started life poking fun at people trying to use PCs unsuccessfully. It wasn't out of malice, but as revenge for all the painful tech support most of us geeks regularly had to perform, for free, for friends and family. But then a seismic shift began to take place. The stories of dumb end users trying to navigate through Windows or PCs began to dry up.

Was the population getting smarter and more tech-savvy? Far from it. Many were simply drifting across to easier technologies, such as tablets, or mostly focusing on one web site: Facebook. And they took their tech ignorance with them. Facebook is overwhelmingly the dominant source of end user stupidity for this column, so much so that we could permanently devote it to people who get fired (or jailed) for inappropriate posts. To be fair, the site's shifty approach to privacy and woefully (and deliberately) confusing interface don't help, but you get the sense that even if Facebook had a best practice approach, it would still be overrun with those who can't see the consequences of their posts.

REDUNDANT ROLES

It was clear early on that people could lose jobs over what they posted on Facebook and there were some high-profile cases. One of our all-time favourite Facebook firings was this one from New Zealand, where in late 2010, Tania Dickinson described her role at the New Zealand Ministry of Social Development on her Facebook profile as a "very expensive paperweight". If that wasn't enough, she then explained that she herself was "highly competent in the art of time wastage, blame-shifting and stationery theft". Needless to say, this was followed by a dismissal letter.

Then there was the Virgin Atlantic crew that criticised the airline in a Facebook chat, in which they openly discussed how often planes' engines were replaced and that aircraft cabins were infested with cockroaches. Not surprisingly, Virgin wasn't happy and fired them.

But despite plenty of examples such as these, people still commit the same stupidities. Like the nursing assistant in Portland, Nai Mai Chao, who was fired and spent eight days in jail earlier this year after posting pictures of a dying patient's buttocks on Facebook, which she captioned with insults. Other photos the nurse from hell posted included faeces from patients. She was caught out when a fellow worker recognised the bedsores on a dying patient. She was banned from nursing and asked to write a 1,000-word letter of apology to the patient.

Last month, two jail officers from Oconee County Jail in the US lost their jobs after sending Facebook friend requests to a 23-year-old female inmate and engaging in conversations of a sexual nature. The inmate's boyfriend wasn't too thrilled at the requests from his girlfriend's captors and passed them on to the authorities on her release.

OUT OF CONTROL

This last one closer to home didn't involve a firing, but the sheer stupidity makes it too good to leave out. A Toowoomba teenager (we won't repeat his name because he was, after all, a teenager) posted on Facebook that he had abandoned the scene after losing control of his car at high speed and crashing through a fence in Glenvale.

He boasted that he'd been trying to 'drift' his Toyota around a corner, but lost control and smashed through the fence. His Facebook post was passed on to the police who came calling a few days later, after discovering that the car was also unregistered and uninsured. He was disqualified from driving for three months.

ENDUSER

Share the hilarity!

Do you work in the IT industry and are forced to deal with inept and clueless end users on a daily basis? Do you have an IT professional, who isn't that 'professional'? If you have an interesting or amusing story, email us at contact@apctest.com. All correspondence becomes the property of APC and is subject to editing. Letters must include writer's full name, street address, suburb, state and phone number to be considered for print publication. Address and phone details will not be published.

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8/10 To infinity...

The *APC* team reviews the latest PCs, tablets, smartphones, gear and gadgets, starting with ASUS's new Android tablet.

LAPTOP

www.asus.com.au @

32GB Wi-Fi, $600; with keyboard, $800 $

Solid build quality, slim profile, good performance. ✔

Adding a keyboard results in a premium price, no 3G option yet. ✖

While we were hoping for an absolute flood of Android tablets in 2012, what we've seen instead is a steady trickle, and while some have been competent, most are pretty average. Perhaps the most interesting trend has been the decisive split between premium models (selling for over $400) and bargain basement options. ASUS has been one of the heavier hitters at the upper end, clearly setting itself apart with its optional keyboard docks that deliver not just the (vague) promise of better productivity, but extra battery life via a second internal battery, too.

The Infinity is ASUS's third major tablet to hit Australia this year (not including the Google co-branded Nexus 7), but in many ways it's an incremental upgrade from the Transformer Prime TF201. Like the Prime, this is another solidly built 10.1in tablet, with a brushed aluminium alloy chassis that's just 8.5mm thick, which makes it look and feel tough as nails. The design isn't quite as clean or sleek as Apple's iPad, but it easily trumps the plasticky Android competition for sturdiness. We're a little less sold on the colours – purple-grey or white gold wouldn't have been our first choices.

There's lots of grunt under the bonnet, with a quad-core Tegra 3 processor (running at 1.6GHz, up 300MHz from the Prime's 1.3GHz), 1GB of RAM and 32GB or 64GB of internal storage. It weighs just on the right side of 600g, too, making it comfortable to hold and use one-handed.

The Infinity's core appeal really boils down to its screen, however. This is the first Android tablet to pip the Full HD resolution mark, with a 1,920 x 1,200-pixel Super IPS+ display that's sandwiched underneath Gorilla Glass 2. While it's not quite as vibrant as the AMOLED displays Samsung uses, that extra res is immediately noticeable – this is now, without doubt, the cleanest and sharpest 10in Android tablet you can buy. Games look superbly crisp and reading large slabs of text is more pleasurable, thanks to clearer-rendered fonts. On the downside, it's not quite Retina-beating; there are still occasionally visible pixels, unlike on Apple's 2012 iPad, which packs a higher 2,048 x 1,536-pixel resolution. The battery life here is respectable – we averaged around eight to nine hours of screen-on time, with mixed tasks, such as gaming, web surfing and productivity. The dock adds four to five hours.

There are a few other niggling shortcomings with the Infinity elsewhere, though. It's running Ice Cream Sandwich (Android 4.0), for example, not the latest Jelly Bean (Android 4.1), and while ASUS has promised an update, it didn't have any further details at the time we went to press. The plastic strip across the top back edge of the Infinity's casing – there to fix the Wi-Fi and GPS signal problems of the Prime – also clashes a little with the brushed metal finish elsewhere.

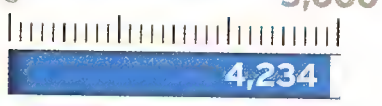
There's also the overarching problem that Android's still a little lacking for good productivity apps, although they're improving. ASUS has bundled Polaris Office and its own note-taking app, which are both among the better options.

While the Infinity is fairly priced on the street and only commands a small increase over the Prime – the 32GB model goes for around $600 sans dock, compared to around $550 for the Prime – there's no mistaking that this is a premium tablet. Add a keyboard and you're looking at an $800 outlay. With the price of other 10in models dropping (Samsung's recent Galaxy Tab 2 10.1 can be found for under $400 from some Australian online retailers), you pay more for this thin and mostly stylish design, metal chassis and higher-res screen. On the other hand, if you're after the most impressive Android tablet money can buy right now, this one's tough to beat.

Dan Gardiner

Benchmark results:

Quadrant



GLBenchmark 2.1.5

HIGHLY apc RECOMMENDED

8/10

Samsung Galaxy Note 10.1

Take note, this is one fine tablet.

TABLET

www.samsung.com/au @

$589 (16GB Wi-Fi) $

Fast internals, unique and useful features, good screen, microSD slot. ✓

No HDMI out without adapter, screen not Full HD, plastic chassis. ✗

With all the attention in the Apple versus Samsung war of late centring on the latter's US$1 billion patent suit loss, it's good to see some action where it matters: the products. Samsung's latest run at creating an iPad killer is this spin-off from its 5.3in 'phablet' Galaxy Note. It's a fairly competent 10.1in offering with unique features, and is arguably the most powerful Android tablet yet: it's equipped with the same processor as the Galaxy S III (the 1.4GHz quad-core Exynos 4412), plus 2GB of RAM – or twice that of any other 10in tablet – and 16 or 32GB internal storage. In practice, Android 4.0 flies along and the Note 10.1 can handle memory-hungry tasks with aplomb, like lots of open tabs in the browser, or editing images with the included Photoshop Touch app.

The PLS screen (using Samsung's new Plane to Line Switching tech) gives a remarkably clean and even image, but it's not quite as vibrant as AMOLED. It's also still only 1,280 x 800 pixels, unlike the 1,920 x 1,200 offered in the ASUS opposite. There's an internal microSD slot for adding more storage, but sadly no HDMI output built in (you'll need to pony up for an additional dongle to add it).

What makes this a 'Note' as opposed to a Tab is the comfortably sized stylus and handful of pen-driven apps. There's a sheath for stashing it in the base and using it is optional – you can still drive most apps with your fingers, although the pen is useful for productivity tasks. It's responsive enough for sketching, and you can take handwritten notes with it. It's also great if you need more precision – such as selecting small cells in spreadsheets. Samsung's note-taking app, S Note, is pretty good at translating handwritten notes into typed text too.

We tested the Note 10.1 across our usual gamut of productivity and entertainment tasks, including writing this review, gaming, watching movies, reading news and surfing the web, and it handled most with reasonable panache. While the Note's design is friendly, it doesn't have the robust feel of Apple's devices, with the lack of metal in the chassis a clear differentiator. It's not that it feels weak, per se – it's quite rigid when flexed – but its plastic casing doesn't feel as damage-resistant as an iPad. The keyboard isn't as responsive as the iPad's either – it can occasionally miss keystrokes during intensive, fast typing sessions.

Battery life with our test unit (a Wi-Fi model with 16GB of storage), was admirable. We were able to get almost 10 hours of screen-on time between charges from the 7,000mAh battery across a week of testing. Expect slightly higher idle drain if you opt for the cell radio-equipped (3G/HSPA+) model, which should be out shortly.

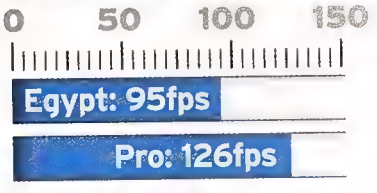
Samsung has a reasonably winning tablet here, but it's not quite an iPad killer; in particular, that RRP is still a touch higher than we'd like, especially considering the equivalent iPad is $50 cheaper. If you're dead set against the iPad, this is undeniably Samsung's best Android tablet yet.

Dan Gardiner

Benchmark results:

Quadrant

GLBenchmark 2.1.5



4/10 Kogan 10in Agora 16GB Tablet

Cheap and cheerful, but we'd rather have a Nexus 7.

TABLET

www.kogan.com.au @

$199 $

Inexpensive and simple, HDMI output ✔

Terrible performance, low battery life. ✖

Kogan's long been in the technology field offering cheap gadgets, but that kind of bargain only works as long as technology remains expensive. The Agora 10in tablet is something of an interesting proposition in that case, because when it was announced, a 16GB Android 4.0 (aka Ice Cream Sandwich) tablet for under $200 seemed like a bargain, even if it was of the usual Kogan quality.

The Agora is a fair tablet for the money in terms of build quality, but it's been eclipsed by Google's own Nexus 7. While the Nexus 7 only has a 7in display and no HDMI out or microSD slot, it's also running an Nvidia Tegra 3 processor, rather than the very plain 1GHz ARMv7 chip found here. That equates to considerably more sluggish performance, and it's something that's exacerbated by the often slow touchscreen. The Agora has a decent enough IPS panel, but we found it often lagged in actual use, making it only worthwhile if your needs were modest.

Its battery life was likewise ordinary, with the tablet conking out at just under four hours of video playback. In benchmark terms, the Agora managed 323 in Geekbench 2, 1,932 in Quadrant and 33,879 in BrowserMark; by comparison, the Nexus 7 clocks in at 1,514, 3,676 and 128,060, respectively. That's a staggering gulf for the Kogan to cross.

If you just want a cheap tablet to play with and have lots of patience, the Agora 10 is a fair buy, but we can't imagine why you should settle for it when there are other options.

Alex Kidman

7/10 Toshiba All-In-One LX830/007

This all-in-one ushers in a bronze age of Windows 8 computing.

ALL-IN-ONE PC

www.mytoshiba.com.au @

$1,600 $

10-point multitouch, built-in TV tuner, decent performance. ✔

Low-end GPU, clunky styling, no cache SSD. ✖

We were initially amused at Toshiba's marketing of the LX830 as the all-in-one PC that's 'one for all'. But having unpacked this Windows 8-ready desktop and taken it for a spin, we're coming around to the *Three Musketeers* reference. However, it's not the only thing about the LX830 that seems out of time.

This forward-thinking machine embraces much of the tech you'd expect of a Windows 8 PC – although it only includes Windows 7 at present. Chief among them is its slick 10-point multitouch screen (a 23in 1080p TN panel) and you'll also find a reasonably snappy third-gen Core i5 CPU inside – the dual-core hyperthreaded Core i5-3210M – complemented by a mainstream Nvidia mobile GPU. Together they make for a respectable PCMark 7 score of 2,487 – good enough for day-to-day use – and passable gaming chops, with a 3DMark 11 result of 1,083 making light gaming possible, but not endearing it to the hardcore crowd. The LX830 is also peppered with value adds like a digital/analogue TV tuner, SD card slot and a degree of expandability.

Aesthetically it belongs in either the home office or the '90s – its clunky silver-bronze frame and plasticky wireless keyboard and mouse don't mesh with any living area built after the heyday of sunken lounges. A couple of other misses mar its potential, too – the TV tuner, for instance, isn't much fun without a remote, while the lack of an SSD cache drive strikes us as an unfortunate omission.

Dominik Krupinski

7/10 HP Pavilion dv6-7030tx

Fair specs, fair performance and a fair price.

LAPTOP

www.hp.com/au @

$1,599 $

Great internals, excellent screen, good battery life. ✓

Not particularly portable, middling gaming performance. ✖

The Pavilion dv6-7030tx may not be the most portable laptop, with its thickish profile and 2.5kg weight. It's not the cheapest either, with decent all-rounders selling for under $1,000. Nor does it have the best performance, particularly in gaming where it's adequate more than stellar. However, what it does have is a solid combination of all three, with a relatively sophisticated appearance, up-to-date internals and an overall fair price.

Inside the chassis is a third-gen Intel Core i7-3610QM processor, a powerful quad-core 2.3GHz chip with the latest Ivy Bridge tech, plus 8GB of RAM and a dedicated graphics card – Nvidia's GeForce GT 630M – which is about as slow as we'd want to go for a dedicated chip. It's faster than Intel's HD 4000 integrated graphics (from 10-50%), but you'll still need to play most newer games on low detail quality.

On the outside, the anti-reflective matte LCD screen (at 15.6in with a 1,920 x 1,080-pixel native resolution) makes the screen ideal for watching HD videos. The brushed black metal finish on the lid and palm rest creates a classy look and comfortable feel. HP's also bundled in an HD webcam, Beats Audio quad speakers and 802.11n Wi-Fi, though it doesn't support the newer 5GHz Wi-Fi spec. Around the edges, it features a good variety of ports too, including three USB 3.0 and one lonely USB 2.0, one HDMI, one VGA and one Gigabit Ethernet port.

Open her up and you'll find a near full-size chiclet keyboard with numpad and it's a sturdy unit with a nice matte finish. Watching movies, the dv6-7030tx's battery lasted about 3.5 hours, which is reasonable. Portability isn't one of this one's strengths, however. It's a relatively fat 34mm thick and weighs 2.5kg, so it's not one we'd want to be carrying around on a day-to-day basis.

Daniel Cheng

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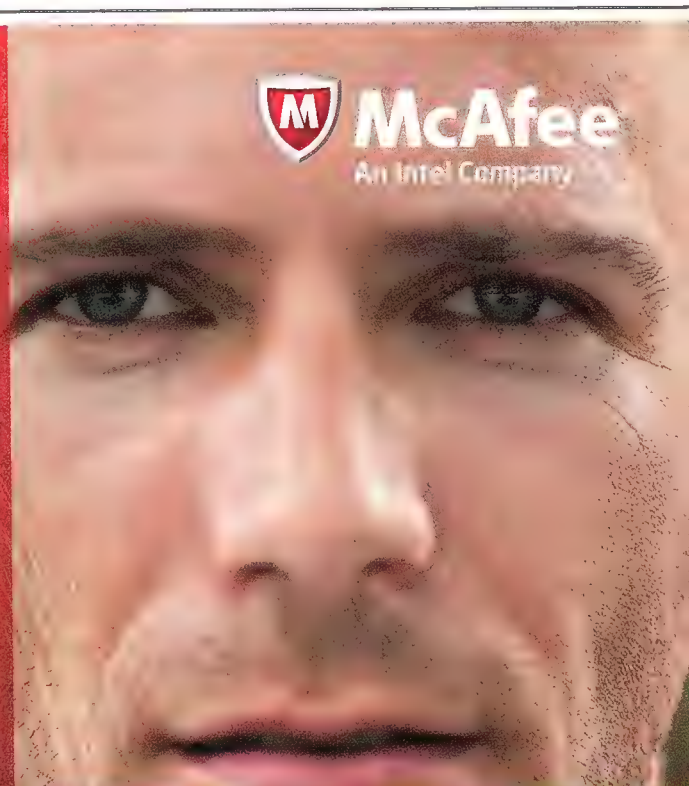

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9/10 Apple MacBook Pro with Retina display

Rendered helpless by its sex appeal.

LAPTOP

www.apple.com.au @

$3,199 $

A wafer-thin, incredibly fast ultrabook with a gorgeous screen. ✔

Expensive at this spec, RAM not user-upgradable. ✖

Apple's new Retina-spec'd MacBook Pro is more than just the desirable screen its name suggests. All four key areas we look for in a laptop are there: screen, speed, battery life and portability. On the outside, you'd be forgiven for mistaking this for a MacBook Air, given its ultrabook-spec'd form factor of 18mm thick and just a touch over 2kg in weight.

On the feature front, it's taken a few cues from its smaller brother, finally dropping the (almost) redundant optical drive and implementing a much-needed port shuffle. The left side now houses the power port, two Thunderbolt/DisplayPort sockets, a single USB 3.0 and audio jack, while over on the right is a second USB 3.0 port, a long overdue (and full-size) HDMI output as well as an SDXC flash card reader.

As gorgeous and beautifully sharp as it is, don't let the Retina display's big numbers confuse you – it's all about pixel density. As with the Retina iPad, by default the increase in pixel count doesn't give you any extra screen real estate. The default resolution is 1,440 x 900, it's just that you now get four pixels for every one when compared to the older displays.

The inside of our 15in review model boasted a 2.6GHz Core i7, 8GB of DDR3 RAM, an Nvidia GeForce 650M graphics chip and a 512GB SSD. It not only chewed up and spat out every hardware test we threw at it, but also happily chugged through *Diablo III* (even at the screen's native 2,880 x 1,800 pixels) until the battery finally gave out at four hours. Impressive.

It's virtually impossible to upgrade – presumably to help it squeeze into its tiny shell, the battery is glued in and the RAM is soldered onto the logic board. If you've got an eye on future-proofing, you'll need to spend more money upfront to get it.

Troy Coleman

7/10 Toshiba Satellite U840W

It's the width that counts.

LAPTOP

www.mytoshiba.com.au @

$1,499 $

Great for movies in cinematic format, comfortable to use, top build quality and design. ✔

Might be a bit tight to fit into bags, average performance, takes time to get used to. ✖

The Satellite U840W makes a fairly bold first impression. Toshiba's billing this ultrabook as the world's first panoramic laptop, with a cinema-like 21:9 ratio widescreen display at a slightly odd 1,792 x 768 native resolution. On first sight, its sheer width is quite surprising; it's a 14.4in unit that sometimes feels more like two netbooks glued together in the middle. It's undoubtedly one of the strangest looking units we've tested.

Apart from those extra wide dimensions, the laptop is tastefully designed – the combination of brushed aluminium and matte black rubber deliver a premium appeal. The design's not only stylish, but also functional, with that rubberised finish also providing excellent grip, and a rubber wrist rest gives more comfort than usual for a laptop. The keys can initially look a little squashed, but are actually comfortably spaced in use, and the backlit keyboard is great if you're working in a dark room. It's a little heavier than other ultrabooks at 1.7kg, but overall there's a thoughtfulness to the U840W's design that's pleasing and encouraging.

As far as performance goes, the specs are fairly standard: a third-gen Intel Core i5 processor is combined with integrated Intel HD 4000 graphics for adequate overall performance, but this isn't a gaming laptop. The U840W also features a 32GB cache drive along with 500GB of storage and 6GB of memory, enough to keep things quick, but not quite class-leading.

Although it's passable for web surfing and office tasks, in order to really appreciate the U840W you've got to use it for its intended purpose: watching movies at cinema-screen aspect ratio. We dedicated a sunny Saturday for just that purpose. With big speakers on both sides of the keyboard that fill out OK and can get quite loud, it feels natural to watch movies on this screen, provided they're formatted correctly. On a DVD or Blu-ray movie that's been optimised for a 16:9 TV (as many are), you'll ironically get black bars on the *sides* of the screen, which can ultimately be just as annoying as the other way around.

Daniel Cheng

6/10 ASUS PadFone

One for all?

SMARTPHONE/TABLET HYBRID

$999 @

www.asus.com.au $

Neat idea, fast internals, smart workarounds. ✓

Limited carrier support, inelegant in parts, cloud makes it redundant. ✗

Although the end result isn't as groundbreaking as it could have been, the ASUS PadFone is hard to fault when it comes to ambition. This combo device is the first (and so far only) smartphone that transforms into a tablet. It consists of two main parts: the PadFone and the PadFone Station, or phone and tablet, respectively. The phone is the heart and brain of the package, with the tablet essentially just a dock – it doesn't have a processor, memory or storage of its own (it includes a microSD slot, though) and if you try to turn it on without the smartphone docked, nothing happens.

While the PadFone sacrifices some elegance, it does so in pursuit of efficiency. There's a promise of being able to seamlessly continue working (or playing) as you switch between the devices and having files, settings, savegames and whatnot safely in the same place. There's plenty of power in the phone to run the tablet, too, with a 1.5GHz dual-core Snapdragon S4 processor, 1GB of RAM and 32GB of storage, plus a 4.3in 540 x 960-pixel AMOLED screen.

In use, however, switching between the two isn't always smooth – some apps won't allow the screen swap involved (the 10.1in tablet screen bumps up the resolution to 1,280 x 800), meaning you have to restart them each time. ASUS has included a partial fix, with a checklist to force desired apps to keep running. This works in many cases, including Chrome, Evernote and ASUS's own productivity apps. Where it often fell over for us was in graphically intensive games, which either stopped responding or shut down.

There are a lot of good, well-implemented design ideas here, too. The tablet houses its own battery, which can recharge the phone while it's docked, and the included stylus doubles as a Bluetooth headset to let you make and receive calls when you're in tablet mode – it's an adequate, if slightly oddball, solution in use. Likewise, the hatch that closes over the phone also acts as a lever that partially ejects the handset, meaning you're not wrestling to unplug it.

On the other hand, there are areas where the PadFone isn't as appealing. The tablet, for example, isn't very elegant. With the phone docked, it's heavy, weighing in at 855g (the phone on its own is 129g) and it's hard to comfortably hold one-handed. It's also thick at almost 14mm and the hatch that covers the phone bulges out even further when closed, producing a noticeable bump in the tablet's profile.

The phone has its issues, too. It lacks a quad-band cell radio, so it won't work on Telstra or Vodafone's 850MHz 3G networks (their primary ones). In other words, only Optus customers need apply. We also experienced fast battery drain and struggled to get through a work day; you'll need to keep the tablet on hand to top up the phone's battery.

There's also an argument that cloud computing makes the idea behind the PadFone redundant. It's already fairly easy to work on a cloud-based document on your phone and switch to a tablet (or laptop or desktop PC) as desired.

While ASUS has done a good job of fixing many of the problem areas, all those caveats add up. And ultimately, as a package the PadFone isn't as elegant (and doesn't offer any great advantage) over having two separate devices. At a cost of $999 upfront, it mightn't save you much cash, either. We'd rather get a phone on a plan and shop around for a suitable Android tablet or an iPad to sate our slate needs.

Dan Gardiner

7/10 HTC One S

A mid-range phone that's sadly sold at a premium price.

SMARTPHONE

www.htc.com/au @

From $41/month (two-year Optus contract) $

Slim and small. ✔

Limited onboard storage, average performance. ✖

HTC's going all out with its One-branded phones and while the earlier One X/XL were premium models, the smaller One S sits much more in the mid-range category, running Android 4.0.3 over a 1.67GHz dual-core Snapdragon S4 processor. As with a lot of mid-range phones you don't get much storage, with 16GB here and less than 10GB actually available to the end user. That's a pity because the One S shares its bigger siblings' lack of a microSD card slot.

The physical design is easily the best part of the phone. If you find the larger displays and bulkier size of the top-of-the-range models (such as the One X/XL or Samsung Galaxy S III) uncomfortable, the One S's 4.3in display, 7.9mm thick body and 120g carrying weight might appeal.

The 1,650mAh battery is adequate for a phone this size; with moderate use we managed to get through a day with around 25% battery life left. On the benchmark front, it scored 871 in Geekbench 2, 3,638 in Quadrant and 78,596 in BrowserMark. This is a solid, but not stellar, performing phone.

For a mid-range phone, though, it's somewhat costly. Optus offers it over 24 months for $41 a month at the time of writing and that can score you a much more powerful phone. Unless the style of the One S really grabs you, that's what we'd opt for.

Alex Kidman

8/10 Motorola RAZR V

Motorola's fat RAZR hides a speedy performer.

SMARTPHONE

www.motorola.com/au @

From $36/month (two-year Optus contract) $

Inexpensive for this kind of power, more comfy than the original RAZR. ✔

Stupidly small onboard storage. ✖

The RAZR V is Motorola's cheaper take on last year's RAZR design, although for a cheaper phone, you technically get more – or at least a phone that's a little more bulky, with the sides bulging out from the original's 7.1mm thickness to a heftier 8.4mm. That's actually to its benefit, though, because it makes it easier to grasp in a single hand.

Elsewhere, the passage of time means that the cheaper RAZR V uses the same dual-core 1.2GHz processor as its predecessor, although the limited onboard storage is a worry. Thankfully, this isn't a sealed phone, so you can add storage via microSD card. The phone also retains Motorola's clever Smart Actions on board. These are location- and time-specific actions that help with battery life, profile management and the like in a similar way that Sony's Xperia line uses NFC tags.

From a benchmark perspective there's little between the RAZR V and the original RAZR. It scored 1,102 in Geekbench 2, 3,082 in Quadrant and 100,456 in BrowserMark with the stock Android browser.

What makes the RAZR V a solid performer is the asking price, as it's currently an Optus exclusive on a $36 a month plan. Given that its performance puts it in the upper tier of mid-range phones, that's a pretty good price to pay.

Alex Kidman

9/10 Razer Taipan

My Shadow Eagle Fist is superior to your Southpaw Tiger Palm.

GAMING MOUSE

au.razerzone.com @

$99.95 $

Comfortable, fully macroable mousing for left- and right-handers. ✔

The green lighting doesn't go with my current ice blue setup. ✖

Choosing the right mouse is one of the more difficult life choices a gamer will make. Get the wrong shape and size or something with weak performance and you're living in a world of cramping, discomfort and wasted ammo. We've seen so many mice in our time we can fairly consistently judge how comfortable they are without even setting a hand on them. So, with the tactical precision of an 800-series Terminator sizing up a 1-percenter for his glasses and leather jacket, when we saw the Taipan we deemed there'd be no way a mouse with those proportions could be comfortable in the hand. How wrong we were.

Coming in at a very slender 124mm long, 63mm wide and 36mm high, the ambidextrous Taipan is perfectly comfortable regardless of whether your grip style is fingertips, claw, palm or fist. The layout and location of the nine fully programmable buttons – left, right, scroll, dpi shifters and dual front and back on either side – makes perfect sense for long-session, comfortable play. More demanding gamers can even take full advantage of the unit's symmetry and go macro crazy on the front and back buttons, which are within pinkie reach.

Crunching the numbers, the Taipan boasts up to a staggering 8,200dpi, all thanks to its dual laser and optical sensor system. That's fantastic on paper, but not having the steadiness of a surgeon, we've never found a compelling or practical enough reason to punch the dpi anywhere higher than the sweet spot of 5,200 without severely hamstringing our performance. Which is where Razer's free Synapse 2.0 software comes into play. The simple-to-understand software acts as an engine room of sorts and it's here that you can assign button controls and record macros, finetune dpi (from 100-8,200), acceleration and polling rates, as well as calibrate the mouse's sensor to the surface it'll be gliding across. Our only issue with the Taipan is that its green lighting scheme doesn't go with the blue on all our other peripherals. And it was so close to perfect...

Troy Coleman

9/10 Astro A40 Wired

We hope you didn't buy another headset prior to reading this review.

GAMING HEADSET

www.astrogaming.com @

$299.95 $

Excellent gaming-tuned sound, compatible with PC and consoles, MixAmp connectivity and functions are excellent, comes with all requisite cables... ✔

... though we wish they were longer. It's also a tad expensive, and has no carry case. ✖

It's surprising how comfortable the A40 headset is, with its stripped-down, utilitarian styling. There's plenty of padding and the swivel points have enough manoeuvrability for domes of all shapes and sizes. The build quality is first-class and designed to last; in the name of science we 'accidentally' dropped our review unit from our desk multiple times, with the Astros shaking off the fall damage-free every time.

Personalisation is high on the Astro agenda and it shows here, with the sides of the headset featuring magnetic 'tag' vanity plates, which allow you to pimp out the look with aftermarket options. The boom mic can be switched from left to right. Sonically it's best to think of the A40s as monitor headphones, in that the histogram is even across the entire range and they feature less colour than the usual bassy gaming headsets. So, 'splosions may not shake your inner ear as much, but above the din you'll hear the guy sprinting toward you with a knife, which we think is critical for living.

The MixAmp Pro (an inline base station) is just as exciting as the cans and, as well as processing whatever source is thrown at it into pseudo 7.1 (not a feature we've cared for), the unit can also be daisy-chained to other MixAmp Pros to create private, lag-free team-based VoIP comms.

We really can't find any negative performance aspects of the A40s: sonically they're fantastic and they're right on the money in terms of comfort, though we would have liked some longer cabling and a carry pouch wouldn't go astray.

Troy Coleman

7/10 Seagate Backup Plus Portable Drive 1TB

Seagate's social drive is suitably speedy.

EXTERNAL HARD DRIVE

www.seagate.com @

$189 $

Flexible SATA-based interface, easy social network backup. ✔

Backups aren't encrypted, costly for a 1TB drive. ✖

How do you make an external drive interesting, given how ubiquitous they've now become? Seagate's latest ploy is to rebrand its multi-interface GoFlex line as Backup Plus. The Plus in this instance refers to the way the drives hook into your Flickr and Facebook accounts – the idea there is that your data online is kept safe offline in case of service disruption or a hack to your account. The one caveat there is that any data sucked down from Facebook or Flickr to the drive is unencrypted by default – or in other words, losing a drive with all your personal data on it would be a very bad idea indeed.

Seagate is offering the Backup Plus range across portable and desktop lines. The model we tested with was the $189 1TB drive. It's a pretty nondescript item, but then beyond colours, there's not much you can do with an external drive. The default connection is USB 3.0, although there's compatibility built in for Seagate's existing range of alternate GoFlex connections, from FireWire to Thunderbolt, although you'll pay extra for the converters.

The drive inside the 1TB Backup Plus is a 7,200rpm Seagate SP2504 and over USB 3.0 it's a decent performer. We averaged read speeds of 85.6MB/s and average write speeds of 45MB/s with a single large video file. Predictably, over a USB 2.0 connection read/write speeds were much slower, dipping to 26.05MB/s and 29.4MB/s, respectively.

At $189, the Backup Plus 1TB is on the higher side of pricing for an external drive. While the inclusion of USB 3.0 and a 7,200rpm internal drive mitigates that somewhat, it's still a pricey option for what it is.

Alex Kidman

3/10 Buffalo Ministation Thunderbolt 500GB

Great interface choices paired with a sub-par drive.

EXTERNAL HARD DRIVE

www.buffalotech.com @

$275 $

Choice of interface, Thunderbolt cable bundled. ✔

5,400rpm drive makes it rather pointless, no bundled backup software. ✖

If you've got a Thunderbolt port on your computer, chances are it hasn't seen a lot of action beyond plugging in the odd Apple-branded display, largely because Thunderbolt peripherals have been few and far between, and expensive. This is a cheaper option, especially since it includes both Thunderbolt and USB 3.0 ports, and cables to match both interfaces are bundled. It looks like many drives that try to match Apple's design style and is preformatted for HFS+.

Thunderbolt has an immense upside, but it's one that's only going to see fruit with the right drive underneath it; ideally, a fast SSD. To keep costs down, Buffalo sells the 500GB MiniStation we tested with a 5,400rpm mechanical drive. The results are sadly predictable. Thunderbolt and USB 3.0 connections averaged a write speed of 77MB/s each, dropping to just 26MB/s over USB 2.0. However, that means you're not really using Thunderbolt to its true potential, making this a drive only really suitable if you're desperate to plug up your Thunderbolt port. A blob of Blu-tack would be cheaper if that's all you really want.

There's definitely a market for an affordable external Thunderbolt storage device, but the choice of a much slower drive makes the MiniStation Thunderbolt an easy one to avoid.

Alex Kidman

8/10 Swann Black Swann

Fun that'll have the whole family screaming "Black Hawk Down!"

HELICOPTER

www.swann.com @

$99.95 $

Built tough, integrated video camera, doesn't cost the earth. ✓

Can't do barrel rolls, short flight time, rotors hurt bald heads. ✗

Don't be fooled by the Parrot A.R. Drone. Sure, it does barrel rolls, is sleek, super-sexy and highly desirable. But when you consider its high price, short flight time and video game-esque destructibility, it falls short of anything close to value for anyone who needs to count coins when heading out for lunch. It's a status symbol.

Enter the mortal equivalent: the Black Swann RC stealth helicopter. Swann, better known for its security products than its avionics, offers armchair aviators surprisingly fantastic out-of-the-box flight with this chopper and for a fraction of the cost of the A.R. Drone. Weighing in at a measly 130g, it's juiced by a rechargeable 3.7V lithium battery and six AA batteries for the remote control. A full charge takes 70 minutes and transfers to eight minutes of flight time; that's by no means lengthy, but considering the spry size also means you needn't leave the house to get some air time, it's not too bad.

Getting the hang of flight is easy and while the stick controls are simple to master, we wouldn't recommend it for really little ones – because it does hurt if you get hit by the spinning rotors (yes, we tested that, too).

There's also a front-facing camera mounted directly under the cockpit, which records up to 10 minutes of footage to the included 1GB microSD at a resolution of 640 x 480. For those wanting a little more, the video unit happily expands to cards up to 32GB. Given Swann's security camera heritage, the quality is quite good, too.

We gave the Black Swann a beating in our tests and aside from a few dings and scratches, it flies as well as it did on the first day. But if by chance the mission doesn't go according to plan and your chopper ends up in a fiery wreck or the snarling jaws of man's best friend, there's a spare set of rotors included.

Troy Coleman

7/10 Jawbone Big Jambox

Big on sound... and price.

PORTABLE SPEAKER

www.jawbone.com @

$359 $

Stylish design, good audio output, excellent battery life. ✓

Live audio is gimmicky, expensive. ✗

Jawbone's follow-up to its Jambox portable Bluetooth speaker is the aptly named Big Jambox. Our review sample was an eye-catching red, although it's also available in several colours, and it has big, friendly buttons for simple playback controls.

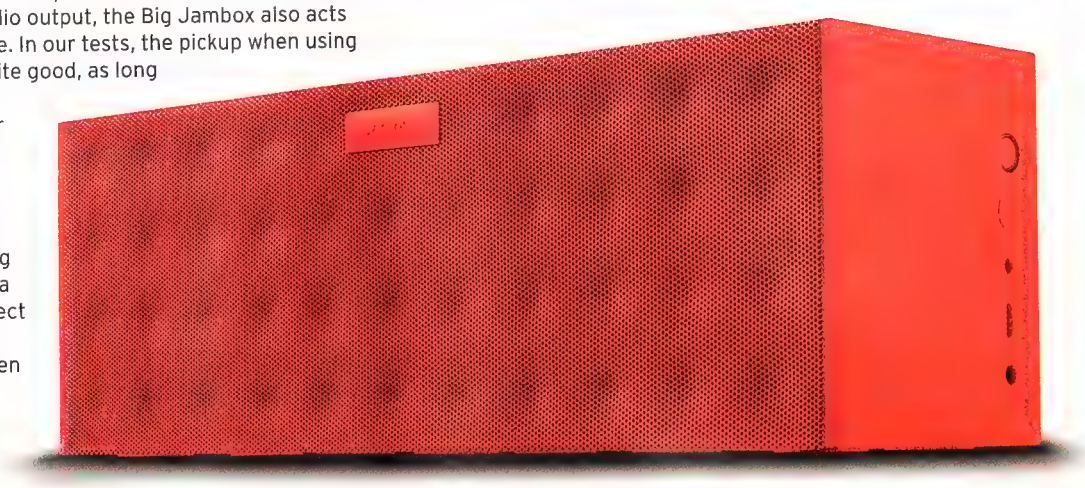
The larger body size also allows for more battery space. While the Big Jambox is more on the luggable than portable side, its battery is rated for 15 hours of playback time and it's polite enough to give you battery estimates with a clear spoken voice on command.

Aside from audio output, the Big Jambox also acts as a speakerphone. In our tests, the pickup when using it this way was quite good, as long as you don't mind broadcasting your calls to everyone in the vicinity.

General audio output was also very good. The Big Jambox features a faux 3D audio effect called Live Audio, which kicks in when you hold down the up and down volume buttons. Like most virtual surround sound setups, it's not terribly good. We found some tracks that picked up a little with it enabled, but most music just sounded hollow rather than enveloping.

All so far, so good – until you hit the asking price. At $359, the Big Jambox has a seriously high RRP and one that just slightly tips the value scales over. If you can afford it and like the style, it's a great premium product, but it's pricey.

Alex Kidman



7/10 Lexmark X748de

Departmental laser MFP with fax.

PRINTER

www.lexmark.com.au @

$3,999 $

Duplex printing and scanning, generous feed tray. ✔

No direct scan-to-PC capability. ✖

Aimed at larger and busier offices and workgroups, the X748de is a colour laser MFP with USB and Ethernet interfaces, and an unusually commodious 550-sheet paper tray. Additional trays are optional extras, giving a total capacity of 4,300 sheets. Installation and setup were unremarkable, though this hefty piece of kit needs two people for safe handling (and don't put it on that rickety old desk).

Rather than using client software on each PC, scans can be directed to FTP servers or sent as email attachments. We're not keen on this arrangement from a user perspective. The printer driver must be installed, so why not add scanning software? In fact, a TWAIN driver is provided, so the X748de can be accessed from Photoshop and other applications.

Scanning and copying gave good-quality results and colour matching. The first page printed out in 14 seconds and page two another 3 seconds. That's around 20ppm rather than the nominal 33ppm, but we saw a run-on speed of around 30ppm for longer, simpler jobs. Printing our test document using the automatic duplexer took 22 seconds. Print quality was as expected from an upmarket laser: even toner distribution with a smooth finish, not too glossy, fine rendering of text and attractive reproduction of graphic and photo elements.

Certain types of files (including PDF, TIFF and JPEG) can be printed directly from USB drives plugged into the front panel. Scans (PDF, TIFF, JPEG and XPS) can be saved to such devices, which is more convenient than the network options.

Stephen Withers

9/10 Fuji Xerox DocuPrint P255 dw

A great small office printer.

PRINTER

fujixeroxprinters.com.au @

$175 $

Speedy, quiet, good-quality output. ✔

Protruding paper tray, Wi-Fi is b/g only. ✖

The P255 dw is cleverly positioned to fill the gap between low-end personal printers, which lack features and may be relatively expensive to run, and pricier models that are overkill for the volume of output produced by most small offices. It's compact, easy to set up, speedy, gives good results and includes duplex output as standard.

The installer includes animated setup instructions, and the main choices to be made are the connection method (USB, Ethernet or Wi-Fi) and whether you want the optional IPv6 support and the PostScript 3 driver.

Although it's relatively compact, the paper tray protrudes even further than shown in the photo (right) when it contains A4 paper. The flap above the tray opens to reveal the manual feed tray for envelopes and other special media, as well as the toner cartridge (this model uses a permanent drum), so all normal care and feeding can be done from the front.

The print speed was impressive for a relatively inexpensive model. The first page of our business document printed out in 11 seconds, with page two following in another 2 seconds, which is in line with the 30ppm rating. Duplex output increased this to a still-respectable 18 seconds.

Fuji Xerox claims its EA-Eco toner fuses at lower temperatures, so the printer consumes less power. We weren't able to check that, but our all-black test page had a pleasantly smooth matte finish with light banding. Text and business graphics were reproduced well, reflecting the company's S-LED head technology.

Even though the P255 dw is a mono printer, we tried printing a test photo and were pleased with the results. Switching from 600 to 1,200dpi made a bigger difference here, especially in regard to the highlights in people's hair and the reproduction of the finer end of test patterns.

Stephen Withers

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amaysim UNLIMITED recently won gold for the cheapest mobile plan for high usage in *Money* magazine's "Best of the Best" awards. Though its amaysim's customers who are the ultimate winners, scoring unlimited standard talk and text, unlimited standard access to social networks, unlimited voicemail and calls to 13 and 18 numbers, plus a massive 4GB of data, all in Australia.

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You can purchase an amaysim SIM pack online at amaysim.com.au or at over 12,000 retail outlets including Allphones, Australia Post, Coles, Dick Smith, Woolworths, 7-Eleven and more.

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amaysim
IT'S YOUR CALL

HIGHLY apc RECOMMENDED

8/10

Dell UltraSharp U2713HM

Another high-quality screen from Dell that cuts some (judicious) corners.

MONITOR

www.dell.com.au @

$799 $

Excellent picture quality, very good colour accuracy, power efficient. ✓

Flimsier build quality than previous models, no SD slot. ✗

It may not be the most exciting tech company – with a range of laptops and desktop systems that tend more towards functional than stunning – but Dell sure can thrill one demographic: photo nerds. A case in point – the arrival of the company's latest UltraSharp monitor in our Labs precipitated the usual huddle of office shutterbugs, all curious to check out the (likely) next upgrade to their home photo editing machines.

Nor can we blame them – Dell's been one of the more aggressive proponents of new screen technology in these higher-end monitors. The company was one of the first to offer colour-accurate PVA screens and subsequently IPS panels to consumers at relatively affordable prices, which has served to foster a lot of goodwill among professional artists and wannabes alike. More often than not, you'll find a Dell screen connected to that demographics' systems.

We're happy to report that the 27in U2713HM generally plays to type. This screen boasts another new panel – AH-IPS this time around. Advanced High Performance IPS is a relatively minor update on the IPS tech behind most current higher-end screens, with slightly better colour accuracy and superior light transmission being the marquee features. If you're wondering what that translates to in practice, for this model it means improved power efficiency. The extra light allowed through by AH-IPS makes for a screen that's still very bright, but substantially less power-hungry. We measured a 33W power draw at a still very luminous 75% brightness, which is impressive for a 27in like this.

That said, if you're expecting even more accurate colours, you may be disappointed. It's worth noting that this is an UltraSharp monitor with a greater focus on price than some of the previous models, which means some specs have slipped. This screen's 99% sRGB colour coverage is excellent, for instance, but the outgoing U2711 boasts 110% (not to mention an SD card reader, which is noticeably absent here). Likewise, response time has slipped a little, going from 6ms for the U2711 to 8ms on the U2713HM.

Good luck spotting those on-paper changes in practice, though. We certainly didn't spot any ghosting when testing this monitor with fast-paced 3D games. And the new screen's adoption of LED backlighting is an excellent addition, making for a brighter, high-contrast panel that's capable of excellent blacks and shadow detail. Likewise, the U2713HM ticks the usual boxes of excellent colour balance, exceptionally even backlighting and clean, crisp details that we've come to expect from Dell's higher-end screens.

Together with a price that undercuts its predecessor by $100 right now – and potentially more as online specials roll out – that makes this (surprise, surprise) another great prosumer screen offering from Dell.

Dominik Krupinski

7/10 Gigabyte GA-Z77X-UP4 TH

Thunderbolt isn't the be-all and end-all.

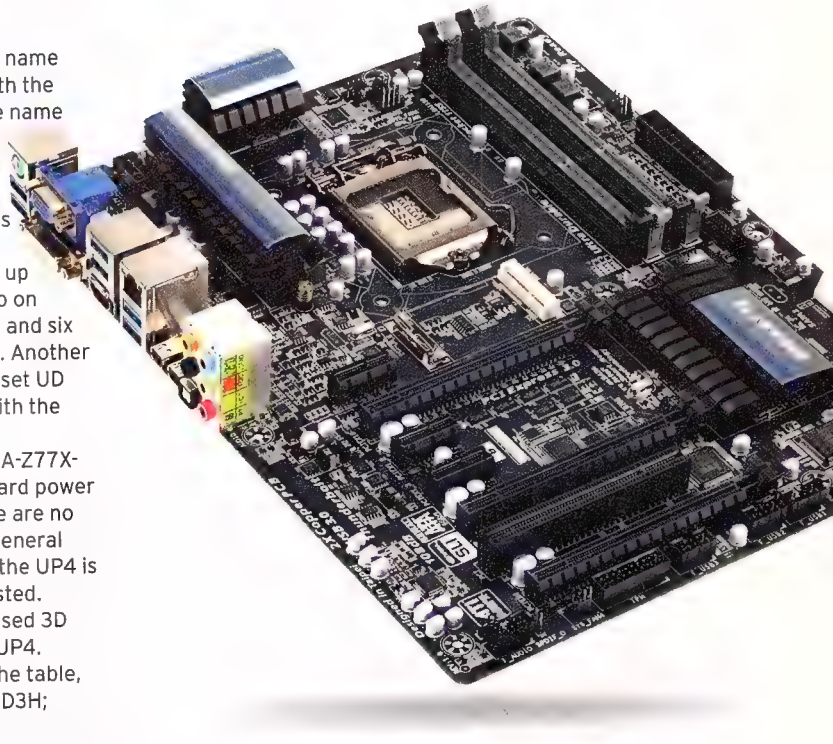
MOTHERBOARD

www.gigabyte.com.au @

$270 $

Thunderbolt brings lots of future possibilities. ✔

Where are the onboard buttons and debug facilities? ✖



For the first time in years, Gigabyte has shed the UD name from its flagship motherboard series, replacing it with the curiously named Ultra Power (UP) series. Behind the name change is the introduction of the Ultra Durable 5 feature set, utilising the IR3550 power stage, which delivers a ridiculous 60amps per phase, translating to power componentry that's not only cooler, but has the potential for a longer lifespan. Supporting the upgraded power credentials are three PCIe slots for up to three-way multicard graphics configurations. Also on board is a single Gigabit LAN port, 7.1-channel audio and six SATA ports, two of which (as usual) are SATA 6Gbps. Another big difference from Gigabyte's earlier Intel Z77-chipset UD boards is the inclusion of dual Thunderbolt ports, with the ability to support up to 12 daisy-chained devices.

Considering this board is closely related to the GA-Z77X-UD3H, we were disappointed that the popular onboard power switches and debug functionality are missing. There are no qualms with the performance, though. Across our general benchmarks and memory bandwidth comparisons, the UP4 is in the upper echelon of all the Z77 boards we've tested. Similarly, when we analysed synthetic and game-based 3D performance, the results also lean in favour of the UP4.

We love the possibilities Thunderbolt brings to the table, but at almost $100 less you can buy the GA-Z77X-UD3H; which is arguably a much better buy.

James Trevaskis

9/10 Gigabyte GA-Z77X-UP5 TH

Gigabyte delivers another strong all-rounder.

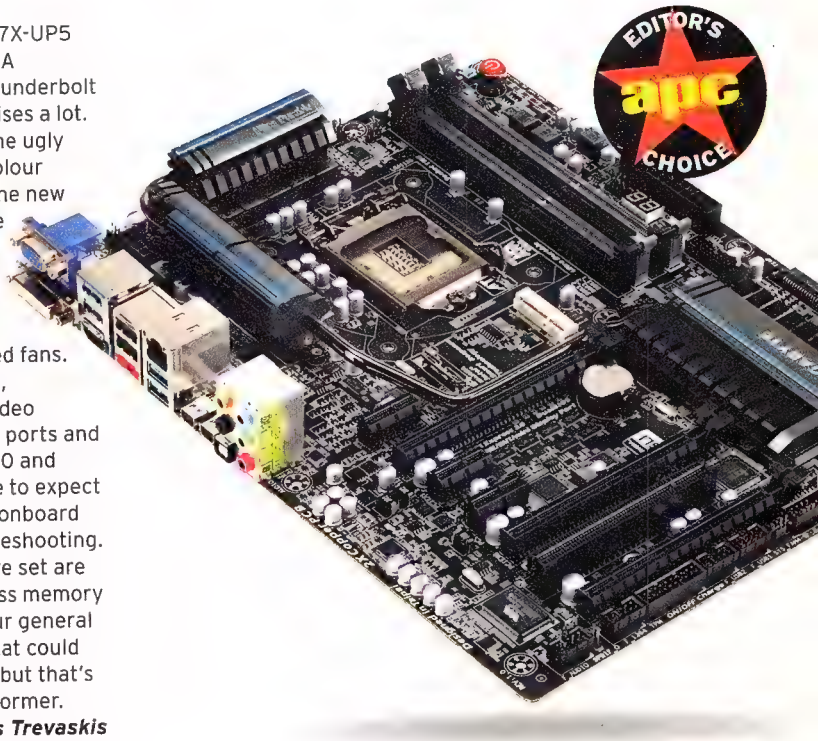
MOTHERBOARD

www.gigabyte.com.au @

$360 $

Best-in-class performance. ✔

Might blow some users' budgets. ✖



With the GA-Z77X-UP7 yet to be released, the GA-Z77X-UP5 TH is currently Gigabyte's highest-end Z77 offering. A combination of the previous GA-Z77X-UD5H, plus Thunderbolt and the Ultra Durable 5 feature set, this board promises a lot.

While both the UD3H and UD5H were a little on the ugly side, the UP5 changes all that. The blue and black colour scheme exudes elegance and when combined with the new heatsink design, visually this board is everything the UD series should have been. The functional slot layout from the UD5 has been maintained, with an oversized three-slot spacing used between the first two full-length PCIe slots. This allows multicard configurations, even when using cards with oversized fans.

Gracing the I/O shield are two Thunderbolt ports, 7.1-channel audio, six USB ports and a plethora of video output options. Gigabyte has also included six SATA ports and a PCIe expansion card supporting both Bluetooth 4.0 and 300Mbps a/b/g/n Wi-Fi connectivity. As we've come to expect from Gigabyte's mid- to high-end boards, there are onboard power switches and debug panels for ease of troubleshooting.

Meshing perfectly with an almost flawless feature set are great performance figures. We measured best-in-class memory bandwidth numbers and strong results across all our general performance and 3D benchmarks. The only facet that could be improved upon is maximum memory frequency, but that's only a tiny drawback from an otherwise a solid performer.

James Trevaskis

THE SSD INVASION

Bigger, faster & cheaper solid-state drives are taking over. Bennett Ring tests 18 of the latest & fastest models.

It's been four years since Intel first introduced PC owners to the concept of affordable solid-state drives (SSDs), and the rise of these performance-boosting bricks from expensive gadgets to affordable staples has been a tumultuous one. While plenty of competitors initially tried to deliver an SSD that could compete with Intel, with some of the industry's biggest memory and drive makers all taking a stab at it, the segment was plagued with incredibly high failure rates of up to 30%. This flew in the face of flash memory's inherent reliability benefits over mechanical hard drives (thanks to their lack of moving parts) and the immaturity and complexity of the tech took many by surprise.

Nobody could deny the performance improvements, though, which became even greater two years later when a startup by the name of SandForce wrenched Intel's performance monopoly away. By late 2011, nearly every drive on the market used a SandForce controller and the problem exists to this day, with a glut of 'me-too' products that are almost impossible to differentiate between. Thankfully, the lifetime issues seemed to have been solved along the way. As with any tech cycle, consolidation took hold in late 2011, with several SSD makers either leaving the segment entirely or pruning back their offerings.

It's only now in late 2012 that SSDs are finally becoming truly mainstream, thanks to the ready availability of 128GB drives priced under the $150 mark. SandForce is also finally starting to see some real competition from other drive controllers such as OCZ/Indilinx, Marvell and Samsung, but the market is still admittedly bloated with SandClones.

If you haven't jumped on board the SSD bus yet, you'll be amazed at the performance increase these 2.5in blocks of memory can yield. Initially, SSD performance focused on sequential throughput, with their ability to copy large files up to 10 times faster than a mechanical drive, making them the ultimate storage space for those working with large amounts of data. However, their ability to shunt around tiny files at breathtaking speed is what really sets these drives apart from mechanical monstrosities. This makes the SSD a perfect home for your operating system, which is constantly fetching and writing a myriad of small files, and the performance increase for day-to-day tasks is comparable with a doubling in speed of your CPU. Yes, it's really that noticeable. Mobile users will also enjoy the benefits of much lower energy requirements, with SSDs guzzling around half the power of a mechanical drive. Finally, SSDs are at last living up to their claims of longer lifespans and it's not uncommon to find three- or five-year warranties on better models.

Despite the massive price drops on SSDs, they're still no competition to mechanical drives when it comes to price per GB. The cheapest drive in our roundup costs 92c a gig, compared to a measly 5c per GB for some HDDs. As a result, one of your first buying decisions will be exactly how much you can afford. While 128GB drives are now within reach of most, you'll be surprised at how quickly a copy of Windows 7, Microsoft Office, iTunes and a handful of games can leave your drive bulging at the seams, which is why the 256GB capacity is the most popular right now.

While all SSDs are fast, some tend to perform better with smaller files at the expense of sequential speeds, so you need to determine what you're going to be using the drive for. Graphic artists and video users will probably want something with higher sequential speeds, while the rest of us will go for those with faster overall performance. As a general rule of thumb, drives with SLC memory will outperform MLC memory, as will drives using synchronous versus asynchronous memory, although both of the former tend to cost more (Toggle NAND is slowly starting to appear as well, promising writing speed increases). Your motherboard will also play a part – if it's only packing a SATA II (aka SATA 3Gbps) hard drive port, buying a more expensive SATA 6Gbps drive is overkill.

As you'll see from the following reviews, there are a plethora of drives vying for your credit card's attention and many of them are based on nearly identical tech. Consequently, we've had to put a high emphasis on price and warranty for those drives that share controllers and memory types. We've put every drive through the excellent SSD-specific Anvil's Storage Utilities benchmark to test theoretical performance, while our real-world file copy tests simulate sequential and bite-sized performance. It's worth pointing out that even the slowest SSD in our roundup will deliver a huge performance increase over your old platter-based dinosaur.

SANDFORCE SF-2281 CONTROLLER
MLC SYNCHRONOUS MEMORY
SATA 6GBPS

7/10

$145

ADATA XPG SX900 128GB

May the SandForce be with you.

www.adata-group.com

Excellent overall performance, healthy warranty, nice extras.

Not the cheapest, not quite the fastest.

Like many SSD manufacturers, ADATA actually started life as a memory maker. Releasing its first consumer SSDs back in 2009, the company has had three years to figure out the intricacies of perfecting the technology. The XPG in the title stands for Xtreme Performance Gear (like, radical dude) and the web site's bold claims of the "most powerful SSD on Earth" make it clear that ADATA intends this product line to offer enthusiast-level performance.

Inside the box is the standard 2.5in-to-3.5in drive adapter, just in case your old tower doesn't have any dedicated SSD bays. More noteworthy is a 16-digit serial key, which can be used to download a free copy of Acronis TrueImage HD, a handy utility for cloning your existing drive to the new SSD. There's also a far less interesting 60-day trial of Norton Internet Security 2012, as well as a couple of other applications. The three-year warranty is healthy by SSD standards.

Using the venerable SandForce SF-2281 controller paired with 25nm Intel MLC synchronous memory, it would be easy to write off this drive as yet another clone using the most popular controller on the market. However, ADATA has tweaked the firmware to eke out an extra 7% of disk space that would usually be off-limits to the user. According to Windows 7, our review sample had a total of 118GB of usable storage space.

Given the SF-2281 controller and synchronous memory type, we expected solid performance and that's exactly what we got. In fact, our theoretical tests placed this drive in the upper echelon, as did our real-world test, although smaller file performance wasn't glowing.

The XPG SX900 is not quite the world dominator that ADATA claims, but it never would be without a unique controller. With a solid warranty and upgrade kit, not to mention an excellent price of just $1.13 per GB, ADATA has delivered a very well-rounded product, albeit one that's similar to much of the competition.

MARVELL 88SS9174-BLD2 CONTROLLER
MLC SYNCHRONOUS MEMORY
SATA 6GBPS

7/10

$129

Plextor PX-128M5S 128GB

It doesn't get much cheaper than this.

www.goplextor.com

Extremely affordable, solid read performance, healthy warranty.

Very poor write performance.

At just $1 per GB, the Plextor PX-128M5S is easily one of the most affordable drives in our roundup, undercut by just one other drive from Transcend. If you shop around you can shave another $20 off the price, making this a very tempting upgrade for those who've been holding out for the cheapest possible price.

There's no such thing as a free lunch, though, so what has Plextor had to cut to deliver such compelling value for money? We'd forgive you if you assumed this was an older product based on the last generation of SSD technology, but you'd be incorrect to do so.

This is actually a very new product, released in the last month before print. Instead, Plextor has shipped the product with absolutely zero fluff – there's no drive bracket adapter or software bundle for those migrating from an old Windows install. However, the three-year warranty is a generous inclusion at this price, and one we didn't expect.

It's also fully SATA 6Gbps-compatible, driven by the Marvell 88SS9174-BLD2 controller, which we're guessing has a lot to do with the budget nature of this drive. This in turn is used to control Micron synchronous MLC NAND memory.

So how does this hardware combo measure up compared to the other controllers that are out there at the moment? Our theoretical tests show a bit of a mixed bag, with excellent read speeds offset by truly lacklustre write speeds – it's less than half as fast as the best drives when it comes to sequential 4MB write speeds, and only slightly better at 4KB QD4 write performance.

Our real-world file copy tests revealed performance much closer to the pack, but we can't ignore the fact that this drive will struggle with the low-level IO tasks required in day-to-day use. It will still be a huge improvement over a mechanical drive, but we can really only recommend this SSD for those on the tightest of budgets.

THREE-CORE ARM9-BASED MCX CONTROLLER

TOGGLE NAND MEMORY

SATA 6GBPS

7/10

$129

Samsung SSD 830 Series 128GB

Not like the rest.

@ www.samsung.com/au

✓ Exceptionally cheap, very slim form factor, free cloning software.

✗ Very average write performance, no drive mount.

It might be better known for building big-screen TVs, but Samsung has also established a strong presence in the SSD market since launching its first consumer drives back in 2011. The 830 Series drives first launched in early 2012, but high pricing held it back from competing. Thankfully, the price has now plummeted over the course of the year, resulting in a cost that's even cheaper than most other 128GB drives at just $1 per GB.

Opening the box reveals a drive that's slightly slimmer than most 2.5in drives at just 7mm deep. Samsung assumes that your case is SSD-ready in this regard because the usual 2.5in-to-3.5in bracket is missing in action. An included CD containing Norton Ghost software makes cloning your old drive a breeze.

Publicly available specs for the drive are limited to say the least, with no information about the drive controller used within. A quick bit of Googling pulled up the necessary information, showing that Samsung has used its own MCX controller, which uses three ARM A9 cores to do the heavy lifting. Unlike SandForce's solution, this controller doesn't rely upon compression to speed up file read and writes, which can lead to issues under certain circumstances.

Our performance figures showed the 830 Series 128GB performing around the middle of the pack in the theoretical read tests, but it drops significantly when any kind of writing needs to be done. Real-world performance is similarly lacking, with one decent result (writing a large sequential file to the drive) dragged down by every other test.

Given the very affordable price tag, we can almost forgive the drive's less than stellar test results, and the inclusion of a three-year warranty is even more reassuring at this price point – others are one year at best. However, if you're willing to spend just $10 or $20 more, there are speedier drives available, which is what we'd recommend.

SANDFORCE SF-2281 CONTROLLER

SATA 6GBPS

TOGGLE NAND MEMORY

6/10

$169

Transcend SSD720 128GB

Too high priced for generic performance.

@ au.transcend-info.com

✓ Slim form factor.

✗ Very expensive, no extra goodies, lacking performance.

Memory specialist Transcend is in a good place to deliver low-cost SSDs, having access to memory in volumes that smaller companies just can't compete with. So why is it that this generic SSD costs almost 30% more than other drives in the 128GB segment? Selling at a whopping $1.32 per GB, this is a rather expensive SSD by anybody's standards, so does it have the performance or features to warrant such a hike?

It's certainly not warranted by the extra goodies packed with the drive, because there aren't any there. With no hint of a drive adapter and no cloning or management software either, first appearances are of a drive aiming to keep its price down. Even the two-year warranty is lacking by the standards set by cheaper drives (the web site mentions a three-year warranty, but our review sample included a printed two-year warranty in the box).

The drive itself uses the same slim 7mm form factor of the Samsung 830 Series and packed within is the ever-popular SandForce SF-2281 controller. While this controller was all the rage in mid-2011, its incredible popularity has since made it rather boring. This aging speed demon is also getting a little dusty by today's standards, as our benchmarks suggest. Looking at the memory type we can see where the extra cost originates, as it uses the newer synchronous Toggle mode NAND modules. Theoretical sequential read and write speeds place this drive right in the middle of the pack, but write performance is anywhere between 50% and 280% slower than the leaders. Real-world performance was similarly average.

Given the high pricing, we simply can't justify the purchase of this SSD. Lacking in features, warranty and performance, Transcend urgently needs to look at the rest of the Australian SSD market to find a competitive price point, as it's currently charging premium prices for a budget product.

SANDFORCE SF-2281 CONTROLLER
MLC SYNCHRONOUS MEMORY
SATA 6GBPS

8/10

$290

ADATA XPG SX900 256GB

A case of déjà vu?

@ www.adata-group.com

✓ Excellent overall performance, healthy warranty, nice extras.

✗ Not the cheapest, not quite the fastest.

We hate to repeat ourselves, but the 256GB variant of ADATA's new XPG range shares much in common with its siblings. The same upgrade kit is included, with a 2.5in-to-3.5in drive bracket, along with a serial key to download cloning software. Strangely, ADATA also provides three separate applications designed for USB flash drives – interesting, yet irrelevant for an SSD. The same three-year warranty suggests the company is confident of the drive's long-term reliability.

Once again, SandForce's ubiquitous SF-2281 controller has been put to work to handle the drive's handiwork and ADATA's tweaked firmware delivers a slight 7% increase in usable storage. The memory type is identical to the rest of the family, using MLC synchronous memory.

Where things obviously differ is in the capacity of the drive. Unlike a mechanical drive, capacity increases can help increase the performance of an SSD because there are more memory modules making use of all eight of the SF-2281's channels. The more channels that are used, the faster the performance. Well, that's the theory at least, as our benchmarks painted a slight different picture.

When it comes to theoretical sequential 4MB reading speeds, the 256GB variant is king and ditto with 4KB QD4 reads. However, the 128GB model had slightly better 4KB QD4 write speeds, which suggests our review samples might have been using different firmware revisions. Our real-world tests were equally confusing, with each of the different ADATA drives taking the top spot in different tests. Regardless, we can still conclude that this is still quite a zippy drive overall.

Given the doubling in capacity we expected to see a more affordable price per gigabyte than its 128GB cousin, but the price remains the same at $1.13 per GB. It's still one of the more affordable drives at this performance and capacity level, but it'd be nice if ADATA could find a little more wiggle room in the pricing.

SANDFORCE SF-2281 CONTROLLER
MLC SYNCHRONOUS MEMORY
FIVE-YEAR WARRANTY

8/10

$299

Intel SSD 520 Series 240GB

Reliable as a rock.

@ www.intel.com.au

✓ Excellent reliability, five-year warranty, solid performance.

✗ Expensive.

It might not hold the performance crown anymore, but Intel definitely has one massive advantage over its competitors when it comes to SSDs: reputation. While early SSDs all seemed to compete in a race to see who could die first, Intel's rigorous testing procedures helped establish the reputation of SSDs that were by far the most reliable. Without access to internal failure rates, it's very hard to definitively state whether this is true, but Intel is still trusted as creating those SSDs least likely to die. With a year of internal validation behind it, the 520 Series continues to build upon that reputation.

Perhaps that's why Intel can charge so much for this drive, which comes in at a hefty $1.25 per GB (just wait until you see the price of the Intel 710 if you think this is steep). The excellent five-year warranty undoubtedly contributes more to that price point than the 2.5in-to-3.5in adapter that comes bundled with the drive, along with a 'Speed Demon' sticker to show the world that your hard drive is faster than theirs. Undoubtedly the high-quality Intel synchronous MLC memory is also a factor. The freely available Intel Data Migration Software and Intel SSD Toolbox utility make setting up and maintaining your SSD a cinch.

Powered by – you guessed it – the SandForce SF-2281 controller, the 520 benefited at launch from a firmware custom designed by Intel's incredibly talented staff. Unfortunately, it hasn't kept pace with the times and our test results show some rather middling performance. In nearly every test, the 520 occupied the middle ranks of our performance charts.

Given the average performance result of this drive compared to the high asking price, you'll probably be surprised to hear that this is the drive used by the author within his main work PC. If we told you he also suffered four SSD failures from other brands in the last two years, the answer becomes more obvious – it might not be the cheapest or fastest consumer SSD drive around, but it's probably one of the most reliable.

SANDFORCE SF-2281 CONTROLLER
THREE-YEAR WARRANTY
MLC NAND MEMORY

7
10

$299

Kingston HyperX 3K 240GB

Performance without the price.

@ www.kingston.com

✓ Solid warranty, above average performance, decent value for money

✗ Lacklustre write performance.

Kingston's HyperX brand is usually reserved for products with wallet-engulfing price tags, sacrificing any attempt at value for money in a bid to perform. Yet the HyperX 3K is a slightly different beast, attempting to both retain scorching performance while offering a price tag slightly less likely to induce cardiac arrest. The key here is the 3K in the product name, which refers to the 3,000 program/erase (basically read/write) cycles that this drive's MLC NAND flash can handle. Many other SSDs use NAND that can handle 5,000 cycles before dying, but it costs more in the process. Fear not, though – very clever software ensures a lengthy lifespan for the drive; unless you only upgrade every decade, it's more than likely that this drive will last for the long haul.

By using more affordable memory, Kingston has kept the price down to $1.24 per GB. This is very reasonable compared to other HyperX products, but it comes up short compared to some of the more value-oriented offerings, especially when we consider the 240GB capacity should also lower the cost. As with most Kingston products, the HyperX 3K comes with the trademark blue brushed aluminium 2.5in-to-3.5in drive adapter, although you'll need to pay extra for the optional upgrade kit, which includes cloning software, power adapters and a SATA-to-USB adapter.

Once again we see SandForce's SF-2281 controller wheeled out for duty and with the assistance of Kingston's firmware, it turned out some very respectable results in our theoretical tests. Unfortunately, real-world testing showed mixed results, with strong read results offset by inadequate write speeds, a trend we've noticed on all of our SF-2281-based reviews. With a three-year warranty proving that 3K cycle NAND modules aren't necessarily a reason to worry, our test results suggest this would make for a good OS disk. However, our real-world results show there's still room for improvement when it comes to write speeds.

INDILINX EVEREST 2
MLC MEMORY
FIVE-YEAR WARRANTY

10
10

$259

OCZ Vertex 4 256GB

Keeping OCZ on top.

@ www.ocztechnology.com

✓ Excellent 4KB QD4 performance, lengthy warranty, outstanding value for money

✗ None!

As the first major SSD manufacturer to back SandForce, OCZ quickly built up a stellar reputation for SSD performance courtesy of the tailor-made firmware solutions packed into their SandForce-powered drives. With SandForce becoming the norm, along with OCZ's acquisition of Indilinx, the OCZ Vertex 4 is the company's first attempt at branching away from the SandForce family. We're glad it did, as this speed demon shows there's more than one controller manufacturer that knows how to make an SSD fly.

This drive uses an Indilinx Everest 2 controller, which is actually a Marvell chip paired with Indilinx firmware to deliver industry-leading write performance. Paired with affordable MLC memory, OCZ has managed to create a drive that's both affordable and outstanding value for money.

At just $1.01 per GB, it's one of the cheapest drives in our SSD roundup, yet OCZ has still managed to attach a five-year warranty to it – very surprising. There's even the usual 2.5in-to-3.5in adapter, which is usually one of the first extras to go when prices plummet this far. The price is even more astonishing when we look at the performance of the OCZ Vertex 4 256GB.

Our theoretical test results show rather slow sequential read speeds, but this drive obliterates the competition when it comes to transfer speeds in the random 4KB QD4 test performance, with 112.84MB/s read results. These kinds of file sizes are most commonly used in day-to-day desktop tasks, showing that this is the perfect drive for mounting an OS and productivity apps on.

Our real-world tests weren't quite as impressive, but they don't measure theoretical OS-style activity anywhere near as accurately. OCZ has been delivering killer SSDs for four years and the OCZ Vertex 4 is yet another win for the company.

MARVELL 88SS9174-BLD2 CONTROLLER

MLC NAND MEMORY

SATA 6GBPS

7/10

$259

Plextor PX-256M5S 256GB

Fails to stand out from the crowd.

@ www.goplextor.com

✓ Very low claimed failure rate, decent warranty, quite affordable.

✗ Lacklustre performance, no extras.

Like its 128GB variant, the larger version of Plextor's new M5S SSD, the PX-256M5S, is all about keeping costs down while retaining respectable performance. At just $1.01 per GB, they've certainly succeeded in providing an affordable drive, but has its use of a Marvell controller compromised its performance?

This SATA 6Gbps drive arrives with a minimum of fuss. The box includes a very brief printed install guide, but that's it. The three-year warranty is standard for drives of this price point, but Plextor is one of the few companies to advertise its drives' annual failure rate. Its claims of 0.5% suggest that only one in 200 drives will fail each year, a massive improvement over the first few generations of SSD. While not quite as exhaustive as Intel's QA, the company tests each and every drive for 20 hours at high temperatures, which is something we'd like to see more companies advertise.

At 9.5mm deep, this is one of the larger SSDs in the roundup, but is still tiny by mechanical drive standards. Marvell's 88SS9174-BLD2 controller is behind the scenes and it's used to access Micron synchronous MLC NAND. Plextor claims this hardware combination delivers the world's fastest sustained random read and write speeds, and the drive did indeed do very well in our 4KB QD4 read performance test. However, our other theoretical performance tests weren't anywhere near as impressive, with the larger M5S falling towards the back of the pack. Similarly unimpressive were our real-world file copy results, which saw the results for the drive falling well and truly towards the tail end of the group.

In a market with so many drives vying for your attention, the M5S fails to stand out in any way other than the claimed reliability. Unfortunately, Plextor's drives don't yet seem to have the solid word-of-mouth trust that Intel's do, making it even harder to notice.

SANDFORCE SF-2281 CONTROLLER

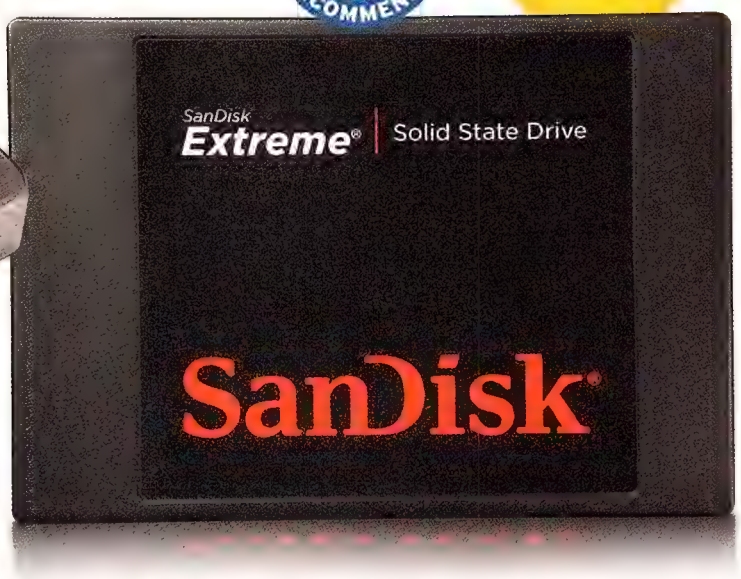
SATA 6GBPS

THREE-YEAR WARRANTY

HIGHLY apc RECOMMENDED

8/10

$220



SanDisk Extreme 240GB

Extremely well-priced.

@ www.au.sandisk.com

✓ Above average performance, low cost per GB.

✗ No added extras. trounced by latest generation.

Like other memory manufacturers, SanDisk has a huge advantage over SSD makers that don't ship mountainous volumes of solid-state memory. As one of the largest companies in the world to sell memory – both to consumers and to other equipment makers – this should give the multinational brand even more of an edge than its competitors, thus allowing it to aggressively target pricing.

At just 92c per GB, SanDisk has certainly delivered upon this potential, making this particular solid-state drive one of the most affordable among the 16 we tested in this roundup. However, you can't expect much else in the way of quality, because SanDisk has kept the price low by offering the bare minimum in the way of extras. The drive arrived in an empty box, devoid of any form of drive mount adapter or software.

The three-year warranty is par for the course – it was in fact standard on most of the drives here, with just a few offering five years. As for the SSD controller, we're not surprised to see this model using the very same SandForce SF-2281 controller that's found everywhere else. Despite the low cost per GB, SanDisk uses 24nm Toggle mode NAND, which appears to be rather more expensive than good old MLC memory. From what we can gather, it's the same memory that appears in Corsair's new Force GS series.

Sadly, it doesn't appear as though the SF-2281 knows what to do with the extra performance offered by Toggle mode NAND, as our benchmarks painted quite an indifferent picture. It managed to test towards the top of our theoretical and real-world benchmarks, yet was still pipped by a handful of other drives.

Despite the middling performance, the SanDisk Extreme 240GB offers excellent value for money, and we can live with the lack of extras considering the very approachable price tag.

SANDFORCE SF-2281 CONTROLLER
SATA 6GBPS
THREE-YEAR WARRANTY

7/10

$245

Silicon Power Velox V70 240GB

Same, same, but different.

@ www.silicon-power.com

✓ Solid performer, healthy warranty, average value for money.

✗ Lost in the clutter of SF-2281 drives.

The Velox V70 240GB is one of the SSDs to use Toggle flash memory, which Silicon Power claims increases performance while also offering a more durable drive. While we don't have three years to test out the latter claim, we can examine the former.

Before we do so, let's take a look at the basic specs. This SATA 6Gbps drive is yet another in a long line of products using the SandForce SF-2281 controller. To be frank, this alone should suggest that we're not going to see anything amazing. Despite its claims about the drive being able to endure more write cycles than most other SSDs, Silicon Power hasn't bothered to explain how it's done so, or provided any numbers to back up those claims. Given the hyperbole we've seen on every SSD product page, we'd take those claims with a very large grain of salt until the company releases more information. The standard three-year warranty doesn't come as any surprise; five years would have left us with more trust in Silicon Power's claims.

While our review sample arrived sans box, it included the obligatory 2.5in-to-3.5in mount. There wasn't any software, though, and there's no mention of it on the official web site, so you'll have to use one of the myriad free programs for any cloning.

Our early performance results were extremely exciting, but sadly it turned out to be a bug with Teracopy, the program we use to measure real-world transfer speeds. After finally getting it to work correctly, our real-world and theoretical testing showed a drive that was smack bang in the middle of the other SF-2281 drives. It's not surprising really – if everybody builds a car with the same engine, body and suspension, but different tyres, it's probably going to perform rather similarly.

With no performance ace up its sleeve, we're left with price as the determining factor. At $1.13 per GB, it's just as affordable as most other SF-2281 drives at this size. But it's also just as forgettable.

SANDFORCE SF-2281 CONTROLLER
SATA 6GBPS
THREE-YEAR WARRANTY

7/10

$340

Verbatim SATA III SSD 240GB

Price doesn't equal performance.

@ www.verbatim.com.au

✓ Decent performance, standard warranty.

✗ 30% more expensive than similar drives.

At first glance, there's really nothing extraordinary about the Verbatim SATA III SSD 240GB. Verbatim doesn't mention anywhere on the SSD's packaging or on the company web site which controller it's used in the device, other than the fact that it's made by SandForce. Perhaps it's trying to distinguish itself from all of the other SF-2281 drives on the market, but prying open the lid reveals that it does indeed contain this most successful of drive controllers.

The memory contained within is your average garden variety Micron asynchronous NAND, which appears to be rated for just 3,000 cycles, although there's nothing on the packaging to indicate as such.

The box is utterly devoid of any extras, with nary a bay adapter or software CD in sight, which is becoming common but would come in handy. The drive itself is also rather plain to look at, making it unsuitable for case modders and the Perspex crew.

Our performance numbers showed excellent results for sequential 4MB read speeds, but the drive fell sharply behind when it came to the smaller file size read and writes. Our real world-tests pegged it among its similarly armed comrades, illustrating once more that few companies have the expertise to make the SandForce SF-2281 shine among so many competitors.

The final checkbox of a three-year warranty suggests that this should be yet another $1.10ish SSD struggling to get any attention. Imagine our surprise when we saw a price per GB of $1.42! It's not downright thievery, but a price gouge of around 30% is still hard to ignore.

The memory that's used here is relatively affordable, as is the SF-2281 controller. The total lack of any extras or a special warranty simply compounds the fact that this drive is overpriced. If there's something special about it, we obviously missed it and Verbatim would do well to look at its product packaging and marketing.

- SANDFORCE SF-2281 CONTROLLER
- SATA 6GBPS
- THREE-YEAR WARRANTY

7/10

$570

ADATA XPG SX900 512GB

Here we go again.

@ www.adata-group.com

✓ Competitive price per GB, solid SandForce performance.

✗ Does little to differentiate itself.

Forgive us if we're starting to sound like a broken record, but if you've been reading all the reviews up to this point, you should know what to expect from this bruiser. The largest in ADATA's new XPG range, the point here is to deliver best-in-class performance. We're just not quite sure how ADATA intends to do that considering it's using the exact same controller as most of the drives on the market.

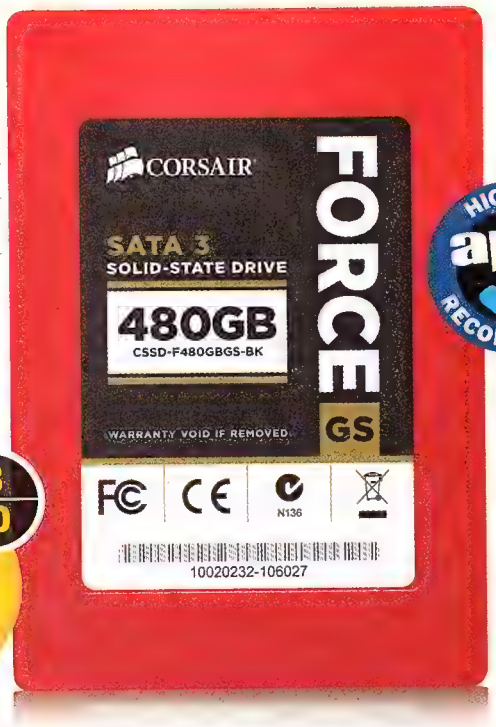
At least the company has gone to the effort of extracting all the power it can out of the drive's flash memory cells. A proprietary firmware delivers a small increase in capacity of 7% over the other competitors using the same controller, which might be just enough to help this drive differentiate itself.

The methodology used to create that increase in capacity is actually rather simple – they've it done by disabling the RAISE feature that's used on all SandForce drives to improve SSD reliability. Worry not, this doesn't mean that ADATA's drive is going to brick itself within minutes of booting up. According to the company, the SF-2281's other error-correction techniques should be good enough for most users and the three-year warranty suggests that ADATA is confident of its product's longevity, and willing to bet on it.

Larger SSDs that are using the same controller tend to be faster than their smaller siblings, so we were keen to see how this half-terabyte monster would shape up in our benchmarks. To our surprise it got pipped at the post by its smaller cousins in the theoretical tests, a trend that would seem to continue in several of our real world tests.

This could perhaps suggest the use of different firmware revisions across the products, or even that the SF-2281 has been designed with a sweet spot that's less than 512GB. At least it's cheaper than the rest of the family, albeit by just 1c per GB, and it represents good value for a drive using synchronous memory.

- SANDFORCE SF-2281 CONTROLLER
- SATA 6GBPS
- TOGGLE NAND MEMORY



HIGHLY apc RECOMMENDED

8/10

$570

Corsair Force GS 480GB

Is Toggle mode NAND really a big deal?

@ www.corsair.com

✓ Excellent write performance in real-world test, healthy warranty.

✗ You'll pay a slight premium for the performance.

A quick glance at Corsair's product page for the Force GS 480GB got us a little excited when we saw that it was using a SandForce SF-2200 processor, and this was reinforced by excellent test results in our Teracopy assorted file test. Sadly, closer examination revealed that this was yet another SF-2281 drive and our initially high Teracopy results were due to a bug with the software. D'oh!

Having said that, the Force GS 480GB is one of the few drives in the roundup to use the newer Toggle NAND memory, which promises better random 4KB write performance – according to Corsair's own benchmarks – so there's that at least.

Unlike the ADATA drive, which uses the same controller, Corsair has left RAISE protection enabled, which results in the slightly lower capacity of 480GB. At its current pricing level, this equates to $1.19 per GB, which is a very minor increase over similarly spec'd drives. This is likely to be due to a combination of the use of Toggle NAND and the newness of the Force GS 480GB, which had only just released to the market at the time we reviewed it.

This NAND delivered excellent test results across the board in our theoretical read tests. Rather than performing exceedingly well in one file size at the expense of others, the Force GS 480GB posts good speeds across the range of file sizes, proving its worth for both sequential and small file copies.

Unfortunately, the write results weren't as impressive, which was surprising considering the use of Toggle NAND. Our real-world tests told a different story, though, with the drive performing extremely well during the writing of small Windows files.

With above average results and a slightly higher cost per GB, the Corsair Force GS series manages to stand out from the pack despite the use of the SF-2281 controller.

- INDILINX EVEREST 2 CONTROLLER
- SATA 6GBPS
- FIVE-YEAR WARRANTY

9/10

$649

EDITOR'S apc CHOICE

OCZ Vertex 4 512GB

It's good to be the king.

@ www.ocztechnology.com

✓ Blistering performance, lengthy warranty, affordable price.

✗ More expensive than 256GB version, low read speeds for small files.

Finally a breath of fresh air among this choking Sandstorm! As one of the first supporters of SandForce, OCZ quickly realised that it would need to find a different solution if it was to retain the lead once everybody else started using SandForce technology. Hence its acquisition of Indilinx and the resulting Indilinx Everest 2 controller that OCZ has decided to use within this behemoth.

This wonder-chip actually comprises a Marvell controller running custom firmware that's hand-made by Indilinx, which explains how OCZ was able to get an Indilinx-branded drive onto the market so quickly after buying the company. This has been combined with quality Intel synchronous MLC NAND memory to deliver the flagship product in OCZ's already desirable consumer range of SSDs. OCZ claims that, unlike SandForce controllers, the Vertex 4's controller is much more adept at handling incompressible data.

Our sequential theoretical performance results weren't outstanding by anybody's standards, but it's when dealing with small files that the Vertex 4 really flexes its muscles. The 512GB takes a big step up in performance over its 256GB relative when looking at 4KB QD4 length files, which are one of the most common sizes in day-to-day tasks. Strangely, though, reading assorted small files from the Vertex 4 wasn't particularly impressive, but the Vertex 4 blazed its way to the top again when it was writing these files.

With a comprehensive five-year warranty – which is more than the average offering – we expected this 512GB monster to cost an arm and a leg. At just $1.26 per GB we were quite happy to be proven wrong, but we're not sure why the smaller 256GB drive works out to be cheaper per GB. Hopefully it's just a short-term price discrepancy due to lesser numbers of the larger drives available, but this model is still outstanding value at the existing price. Recommended!

- TRIPLE-CORE ARM9 MCX CONTROLLER
- SATA 6GBPS
- THREE-YEAR WARRANTY

7/10

$620

Samsung SSD 830 Series 512GB

Bigger and better.

@ www.samsung.com/au

✓ Solid performance, low energy requirement.

✗ More expensive than its smaller variants.

We've got to hand it to Samsung. It's the only entrant in this roundup to build every piece found within its SSD. Both the memory and controller are Samsung-crafted and it has managed to create a respectable drive in the process. Even better, like Intel, the company's built an amazing reputation for longevity since the SSD race began back in 2008. Unfortunately, many users probably didn't even realise they were running a Samsung SSD, as most of its early drives were sold under the moniker of some of the biggest brands seen in this roundup.

Samsung has made a big deal about this series' custom-built SSD controller and with so many SF-2281 drives out there, we can understand why. The MCX controller used here is a triple-core ARM9 chip and as far as we know Samsung is the only company to use these controllers. It's also paired this innovative solution with the new Toggle mode NAND seen in a few of the drives on these pages, but it's all built in-house. Finally, 256MB of DDR2 memory is used as a cache. While there's no drive bay adapter included with the 512GB drive, Samsung has been kind enough to include the Samsung SSD Magician suite of disk management software, which offers both cloning and maintenance features.

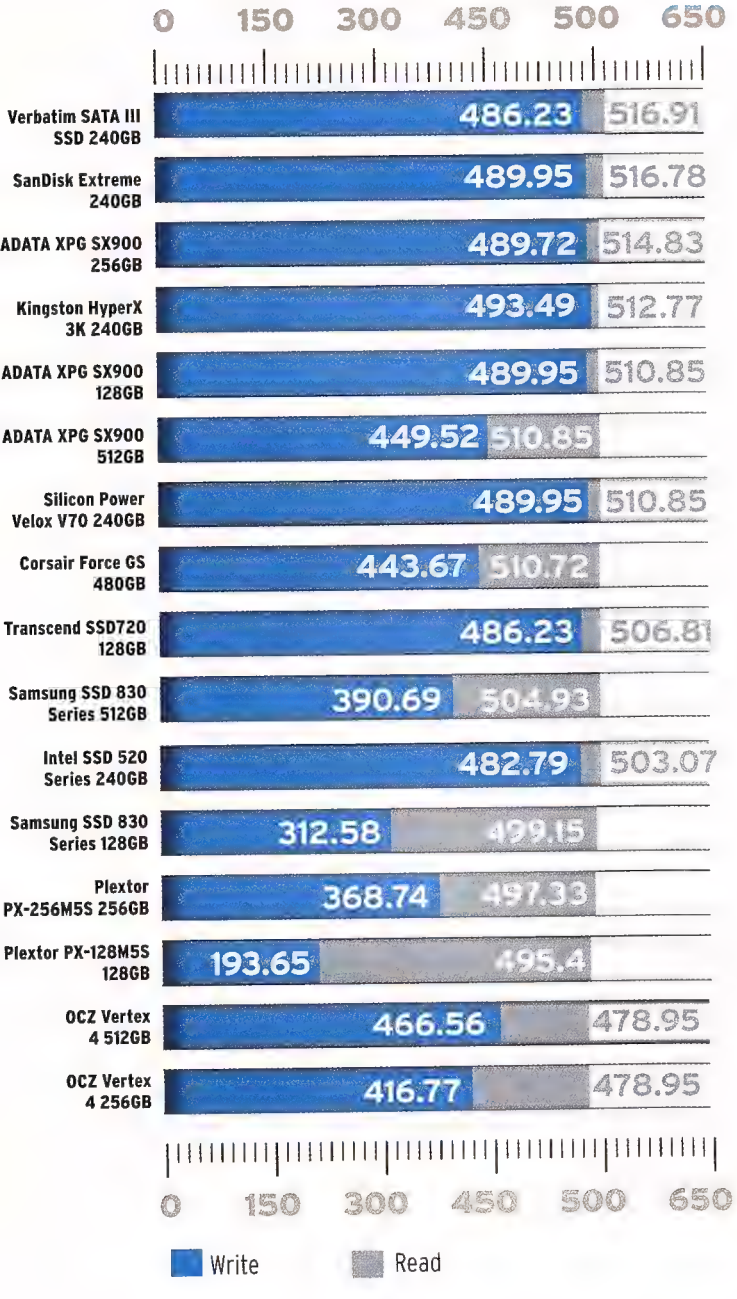
Our theoretical test results show that this hardware combination delivers respectable performance across the board, favouring a 'do everything well' approach rather than specialising in any one area. Meanwhile, our real-world tests showed that the drive has acceptable small file performance, but further to that it excelled at moving around large sequential files, with stellar results.

Buying memory in volume usually equals lower prices, so we can't figure out why the 512GB version is so much more expensive than the 128GB version, at $1.21 per GB versus $1.01. Hopefully the price will continue to decline to below that of its smaller cousins and at that point Samsung should have a solid performer on its hands.

ADATA XPG SX900 128GB | Plextor PX-128M5S 128GB | Samsung SSD 830 Series 128GB | Transcend SSD720 128GB | Kingston HyperX 3K 240GB | Intel SSD 520 Series 240GB | ADATA XPG SX900 256GB

ANVIL'S STORAGE UTILITIES SSD BENCHMARK:

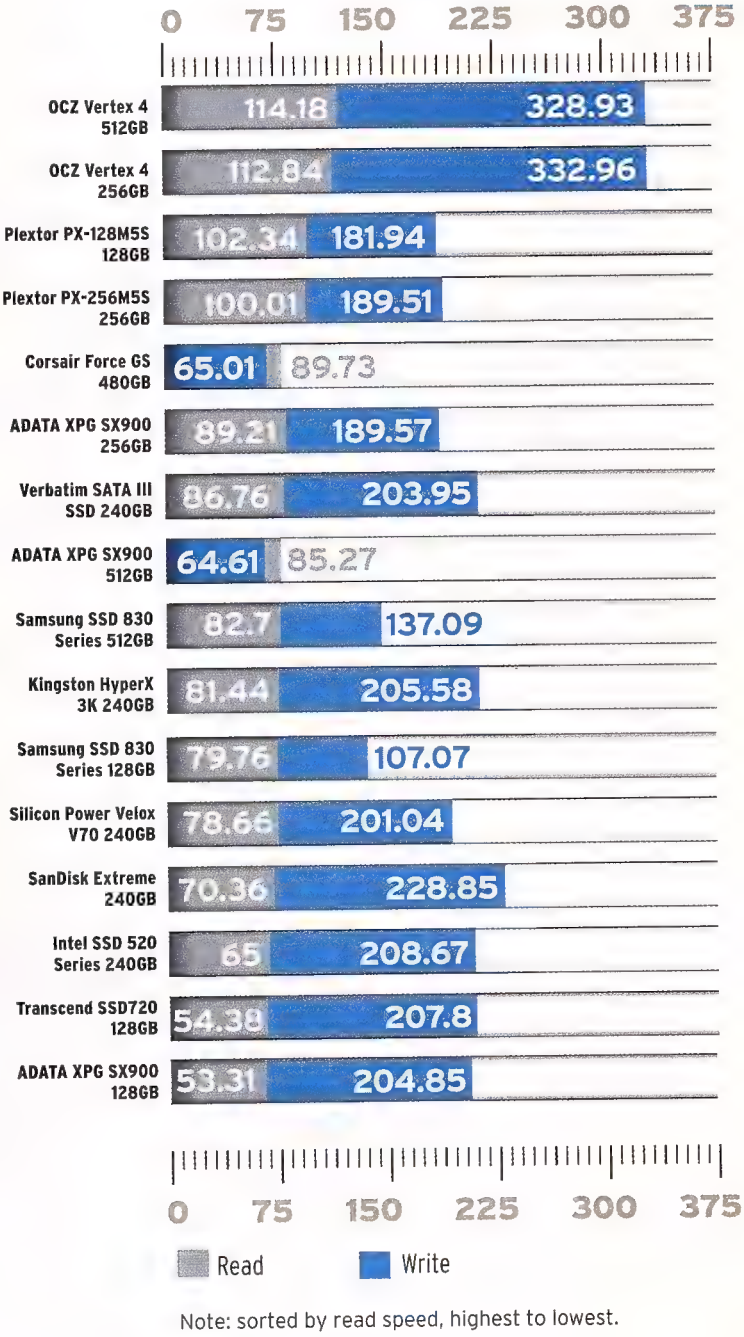
Sequential 4MB transfer speed (MB/s)



Note: sorted by read speed, highest to lowest.

ANVIL'S STORAGE UTILITIES SSD BENCHMARK:

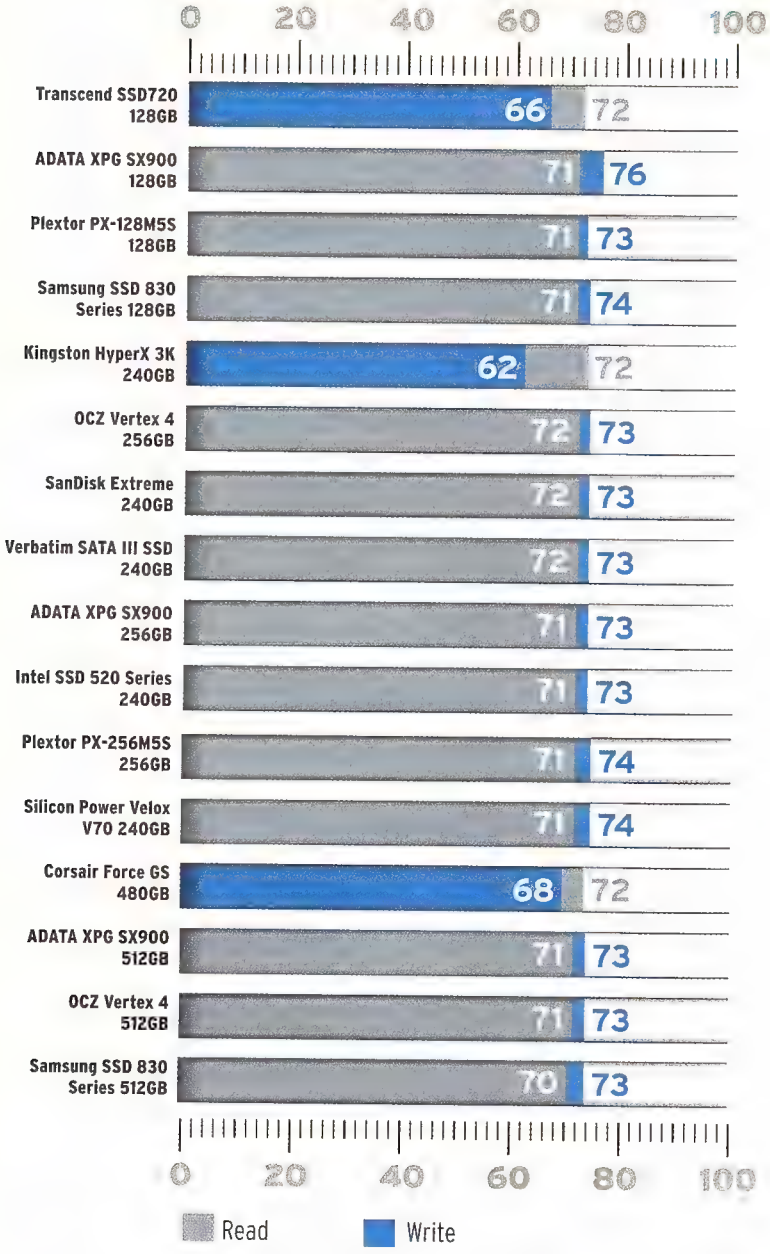
Random 4KB QD4 transfer speed (MB/s)



Note: sorted by read speed, highest to lowest.

REAL-WORLD TESTS

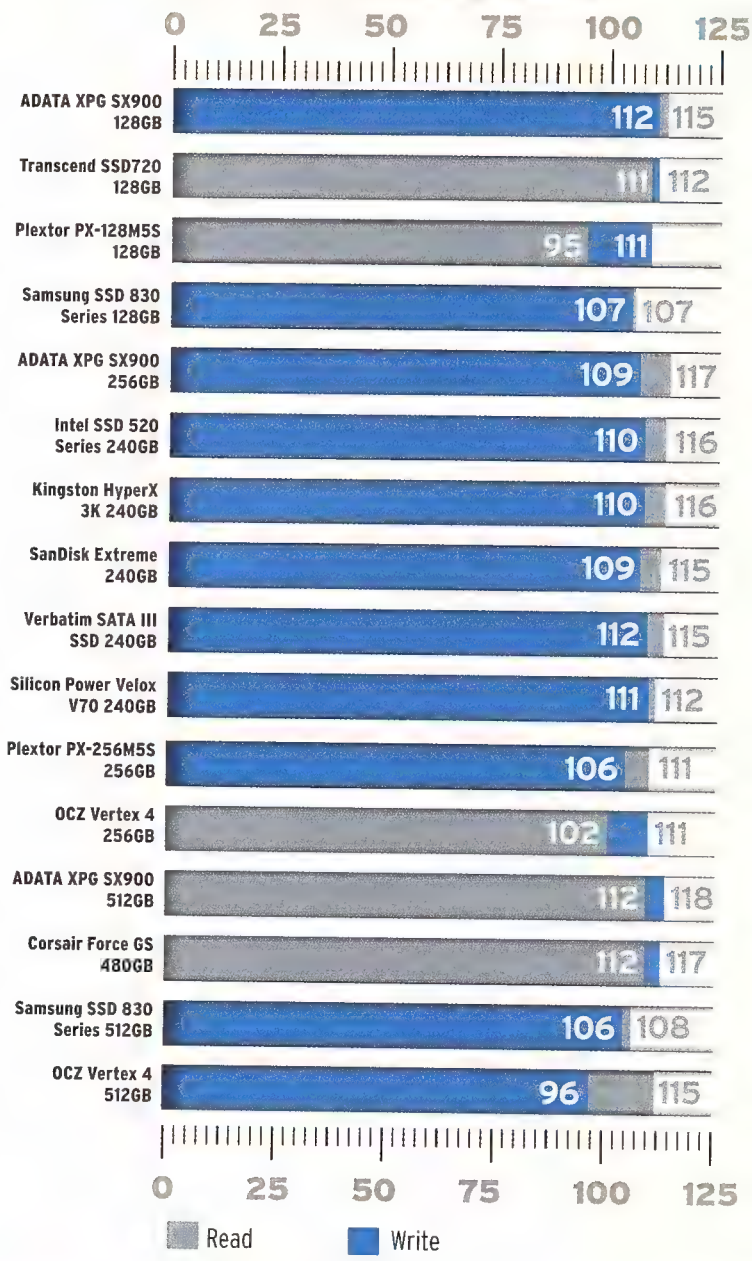
Sustained transfer test (read/write) average MB/s


0 20 40 60 80 100
Transcend SSD720 128GB 66 72
ADATA XPG SX900 128GB 71 76
Plextor PX-128M5S 128GB 71 73
Samsung SSD 830 Series 128GB 71 74
Kingston HyperX 3K 240GB 62 72
OCZ Vertex 4 256GB 72 73
SanDisk Extreme 240GB 72 73
Verbatim SATA III SSD 240GB 72 73
ADATA XPG SX900 256GB 71 73
Intel SSD 520 Series 240GB 71 73
Plextor PX-256M5S 256GB 71 74
Silicon Power Velox V70 240GB 71 74
Corsair Force GS 480GB 68 72
ADATA XPG SX900 512GB 71 73
OCZ Vertex 4 512GB 71 73
Samsung SSD 830 Series 512GB 70 73
0 20 40 60 80 100
Read
Write

Note: sorted by read speed, highest to lowest.

REAL-WORLD TESTS

Assorted files test (read/write) average MB/s


0 25 50 75 100 125
ADATA XPG SX900 128GB 112 115
Transcend SSD720 128GB 111 112
Plextor PX-128M5S 128GB 95 111
Samsung SSD 830 Series 128GB 107 107
ADATA XPG SX900 256GB 109 117
Intel SSD 520 Series 240GB 110 116
Kingston HyperX 3K 240GB 110 116
SanDisk Extreme 240GB 109 115
Verbatim SATA III SSD 240GB 112 115
Silicon Power Velox V70 240GB 111 112
Plextor PX-256M5S 256GB 106 111
OCZ Vertex 4 256GB 102 111
ADATA XPG SX900 512GB 112 118
Corsair Force GS 480GB 112 117
Samsung SSD 830 Series 512GB 106 108
OCZ Vertex 4 512GB 96 115
0 25 50 75 100 125
Read
Write

Note: sorted by read speed, highest to lowest.

Plextor PX-256M5S 256GB | ADATA XPG SX900 512GB | OCZ Vertex 4 512GB | SanDisk Extreme 240GB | Corsair Force GS 480GB | Silicon Power Velox V70 240GB | Samsung SSD 830 Series 512GB | Verbatim SATA III SSD 240GB

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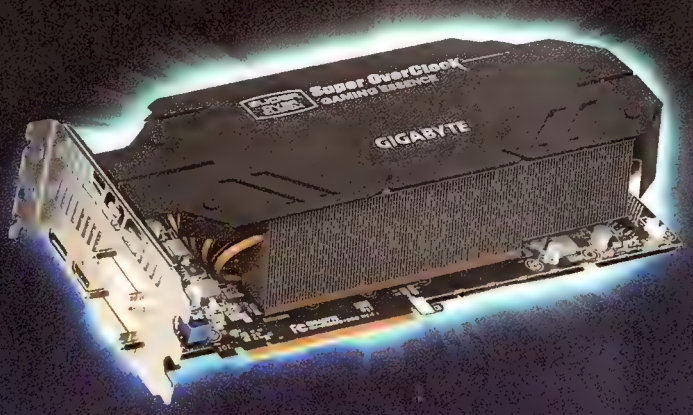

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COMPLETE SSD UPGRADE GUIDE

Solid-state drives (SSDs) can seriously decrease your PC's app and game loading times and boost general responsiveness. In this guide, the *APC* team explains how to upgrade your PC or laptop to speedy flash storage.

If you've been keeping even remotely up to date with tech, it should be no secret that SSDs are playing an increasingly dominant role in the storage configuration of desktop and laptop systems. More robust by virtue of having no moving parts, SSDs are also considerably faster than traditional platter-based drives – up to 10 times so – making them the ideal storage format for boot drives and app storage. These flash-based drives can substantially improve the speed at which your system boots up, launches apps and juggles overflow data if you're performing memory-hungry tasks that max out your RAM. That said, while prices are dropping, SSDs still demand a substantial premium over platter drives. Where a good-quality third-generation 120GB SSD will set you back around $130, the same scratch will buy you a massive 2TB hard drive with money left over for (an admittedly cheap) lunch.

We think a good trade-off is reserving SSD storage for your boot drive, while using cheaper platter-based hard drives as a repository of less speed-critical data, such as media, documents and so forth. In this guide, we'll walk you through making the switch from an HDD-only setup to a fit and fast SSD-based setup with a minimum of fuss.

CAN YOU UPGRADE?

As appealing as SSDs are, as with most newer technology, there are barriers to entry beyond cost. One of the first questions you need to ask yourself is whether your system is sufficiently up to date to see some benefit from an SSD. To start with, you'll want to ensure your system can recognise an SSD and access it sufficiently quickly to make the upgrade worthwhile. Older desktop and laptop motherboards without BIOS-level AHCI support, for instance, won't efficiently communicate with an SSD, rendering much of the speed advantage moot. And while a system without SATA 6Gbps support will still get some speed boost, it just isn't going to max out the rapid transfer speeds current-generation SSDs offer (in that case, your money might be better spent elsewhere).

As a rough guide, we'd suggest that unless your system is currently running Windows 7 – or Vista, for the upgrade averse – SSD storage shouldn't be your first upgrade priority. Windows XP doesn't natively support SSD data alignment, for instance, necessitating command line fixes through DISKPART; regardless, the likelihood that an XP-based system is built on a motherboard with SATA 6Gbps support is remote at best. If your OS is up to date, though, and SATA 6Gbps hardware support is present – check the manufacturer's web site to make sure first – you're good to go.

DECISIONS, DECISIONS

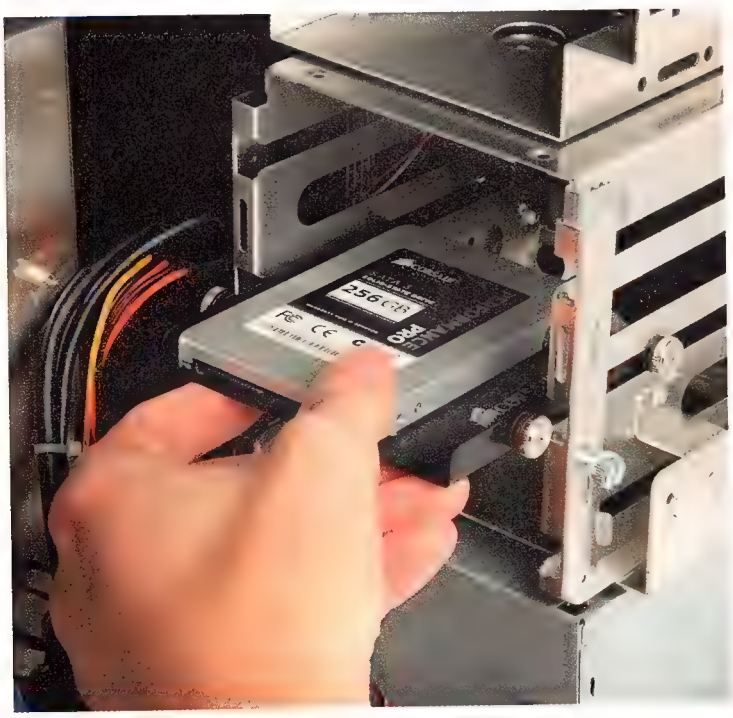
Whether you're upgrading a desktop or laptop system, you're going to have to decide whether to perform a clean upgrade – installing Windows and apps afresh on your new SSD – or transfer your existing installation across. Both have their advantages and disadvantages – a fresh install ensures the best compatibility between the OS and hardware, as well as an easier install procedure, but you will have to reinstall all of your OS and apps. A clone job, on the other hand, saves you the aggravation of software reinstalls, but can be more complicated and (potentially) less stable. We'll walk you through both options here, but first, let's have a look at the hardware side and SSD installation.

INSTALL AN SSD IN A DESKTOP PC

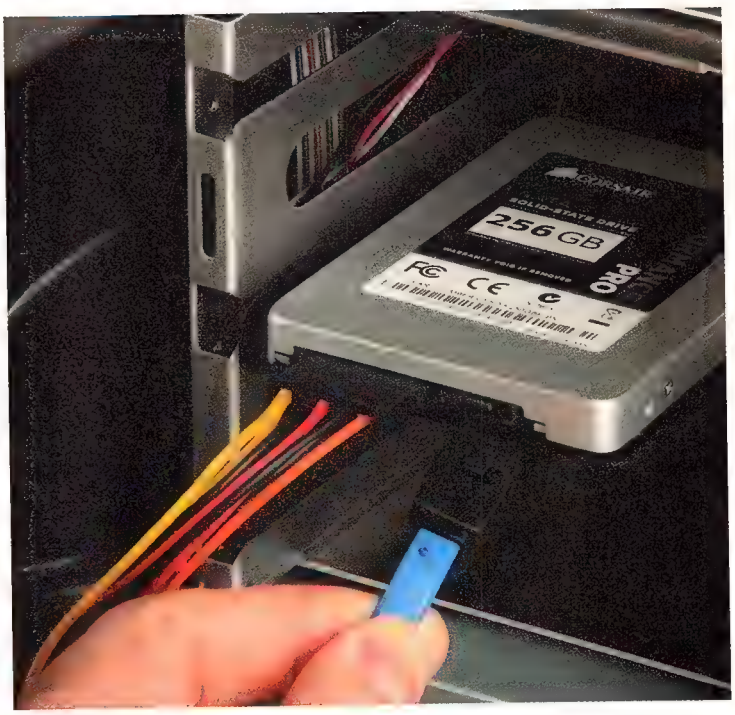
A desktop system is typically the easiest environment to install a new SSD, as it generally doesn't necessitate the removal of an existing drive. The most important thing to check is that your SSD of choice comes with a 3.5in caddy, as some systems don't come with support for 2.5in drives.

01 Install the SSD into a 3.5in drive caddy, adding any screws as necessary.

02 Ensure that your PC is powered off and the power is physically unplugged, then open the PC case.



03 Install the SSD caddy into the appropriate tray, ensuring you have a free SATA (data) and power cable that will reach. Unless your system is packed full of drives already, power shouldn't be an issue – most power supplies come with adequate connectors for six or more drives – but acquiring a spare SATA cable may necessitate a visit to your local PC hardware store. These typically cost well under $10.



04 Screw the caddy into position and connect the SATA and power cables. Screw your case shut again and then continue on to our OS install guide.

INSTALL AN SSD IN A LAPTOP

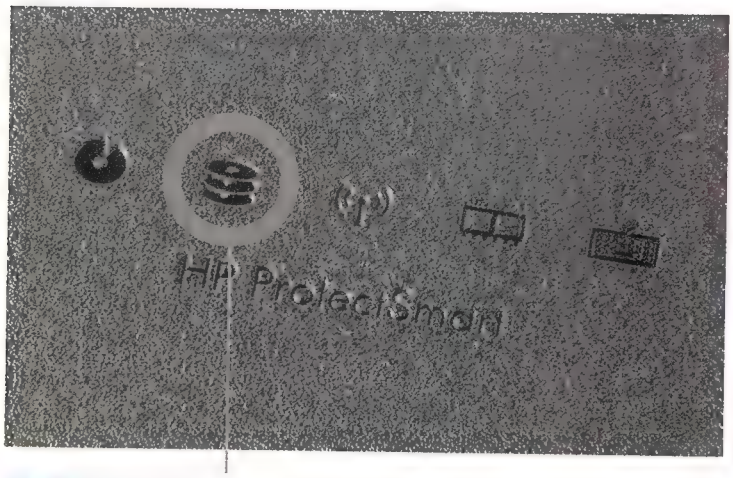
Laptop installation can be more complicated, as you'll typically be replacing one 2.5in drive with another. In most cases, you'll want to copy data across either beforehand (if you want to clone your OS drive) or afterwards (if you're cherry-picking individual files).

We cover both cases further into this article, so it might be worth skipping ahead a little here before returning to the physical installation guide. In either case, you'll need a USB hard drive caddy or adapter cable to copy data from your outgoing drive to your new one. Once again, these are usually pretty cheap and in the case of some SSDs, come bundled with the drive to make the transfer process easier.

Got a data migration plan worked out? Great – here's the part where you take things apart. Just bear in mind that if you're planning on cloning your drive, you'll want to get all that sorted out before you start on these steps.

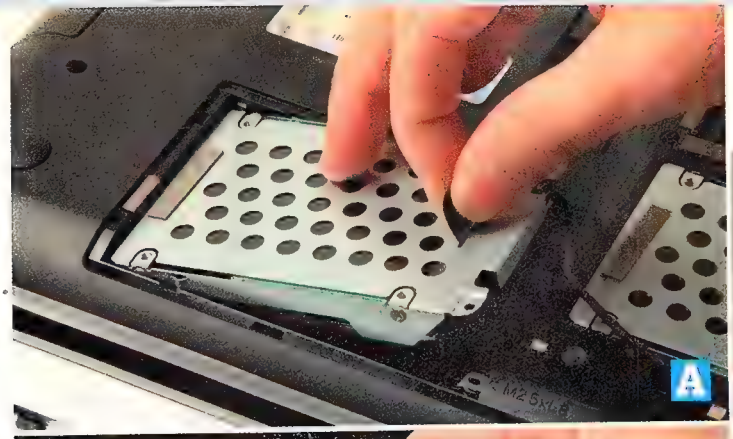
01 Set aside a clear workspace with plenty of additional room for screws as you remove them from your laptop to keep them in order. You'll also usually need good lighting and a set of jeweller's screwdrivers, sometimes including Torx heads (**tinyurl.com/cnw8fyi**). These can be bought at any electronics or PC hardware store on the cheap.

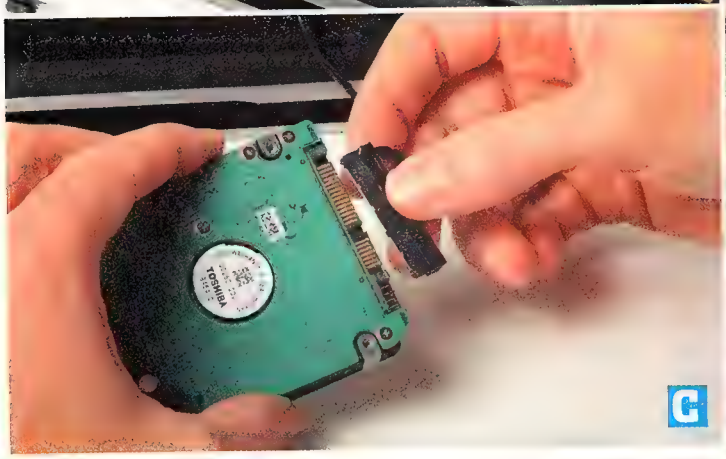
02 Start by turning off your laptop, removing the AC power and (if possible) popping out the battery.



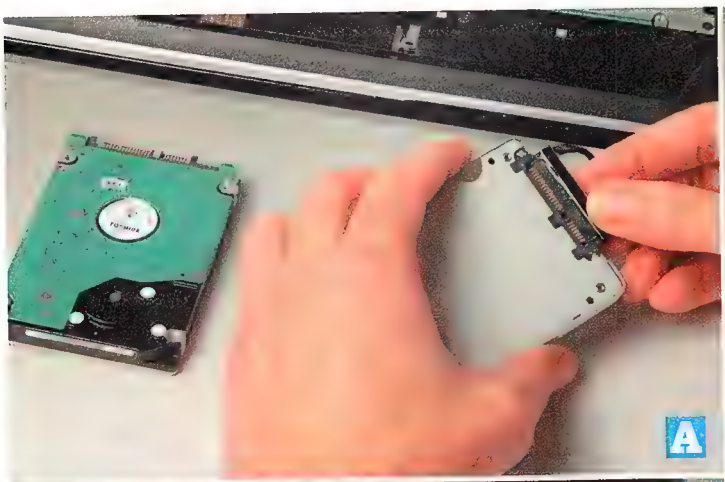
03 Flip the laptop over and look for the hard drive cover (this will usually be denoted by an image of superimposed discs). When you find it, remove the screws and check for any plastic clips holding the panel in place. Pop these open with gentle leverage from your screwdriver, being careful not to force anything – if the panel isn't moving, you've probably missed a screw. If there isn't a marked hard drive panel, you'll have to remove the entire back plate. Same procedure: take out each screw and set it aside, look for plastic clips and carefully lever off the backplate. Gently does it. If the backplate or HDD panel isn't coming loose even after you've removed everything, there might be a final screw under the keyboard. Do a web search to make sure.

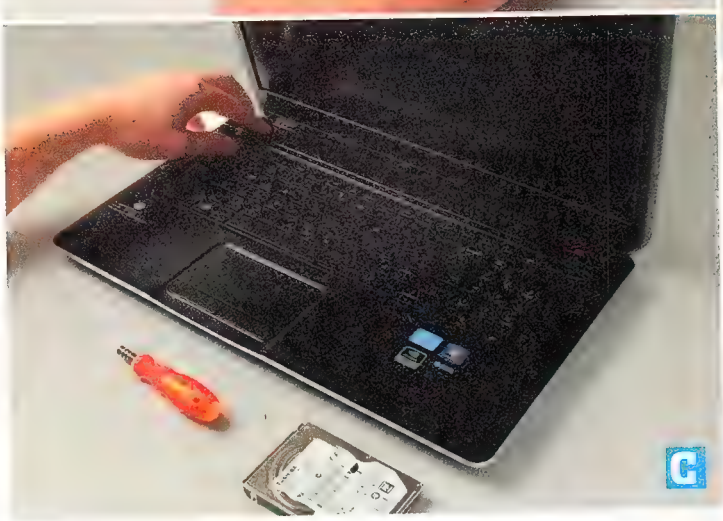
04 Pop the lid. You'll often find attached cables or retaining clips and as with all things laptop, you'll need to go gentle, being careful not to tear any components away; instead, unclipping gently as you go.





05 Find the HDD and look for any retaining screws or glue caps holding it in place. Remove as necessary and carefully pull the drive out of its hidey hole. Gently unplug any cables, then check the drive mounting hardware and swap it over to your new drive if applicable.





06 Take your new SSD, attach the power and SATA cables removed from the old drive, and carefully seat it in the slot previously occupied by your HDD. Repeat the previous steps in reverse to reassemble your laptop, then get ready to power it up and follow the OS install guide on the following page.

Just a quick note: at times, laptops can be infuriatingly fiddly to work with, but as long as you take it slowly and systematically follow each step, you should be alright and the replacement procedure shouldn't take more than 15 minutes. Remember, if you rush things and make a mistake, the repair time will take longer than taking a breath and figuring out what you're doing would have. This is the sort of process that reinforces the adage that patience is a virtue, so chill out, OK?

INSTALL YOUR OS

If you're not cloning across your old drive, this is your next step after installing the hardware. You'll need to have your Windows (or Linux or Mac OS X) install DVD or USB stick on hand and your motherboard (or logicboard, in laptop parlance) updated to the latest BIOS. From there, it's a case of powering up your system again, entering the BIOS and ensuring your SATA configuration is set to AHCI mode (how you do this differs with every system, so check your motherboard/laptop manual for specifics).

After that, simply boot your system from your Windows install media and select your SSD as the target drive for your OS. The installation process is no different from putting an OS on a platter drive, with the exception that if you're installing Windows 7 or 8, all the necessary drivers and settings for an SSD boot drive (such as TRIM support) should be taken care of automatically. In the case of desktop systems with multiple drives, you may also need to set your new SSD as the primary boot drive in your motherboard BIOS. Again, check the manual, as each motherboard is different.

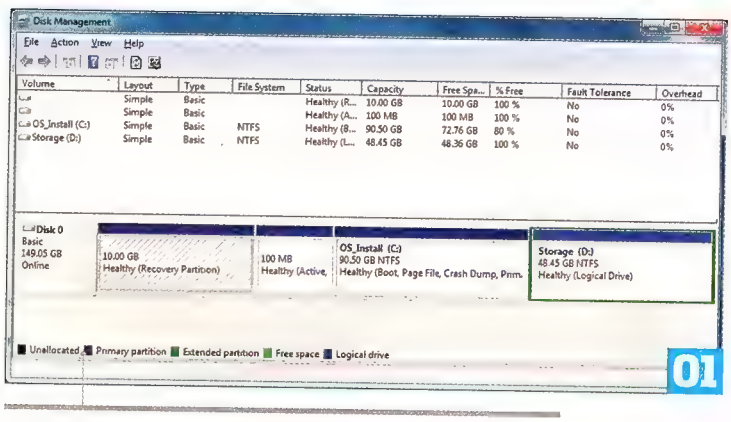
Once that's done, it's a case of the usual driver and app installs to get your system up and running (you know the deal – graphics card and motherboard drivers, a virus scanner and apps), as well as copying across the data from your old hard drive's My Documents folder, your browser bookmarks and other personal files. In the case of laptop data, you'll need a USB-to-SATA adapter/caddy for your old drive to do this. Just bear in mind that with SSDs typically offering less storage than platter drives, you'll have to prioritise what you copy across. Flash storage fills up fast, in both senses of the word.

CLONE YOUR EXISTING OS INSTALL

The ideal way to migrate your old OS install to your new SSD is to clone the entire Windows partition in one go, hitting the ground running with all your apps and data installed on a speedy new drive. There's only one problem: unless you're loaded, chances are your new drive is going to have a lower capacity than your outgoing platter model. If your old boot drive is anywhere near full, that's going to be an issue. That's where a partial clone is going to be your friend. Want more good news? It's something Windows Vista and 7's built-in tools let you do in a snap. By way of example here, we're going to transition to a 60GB SSD from a 160GB laptop hard drive.

You're going to need Windows Disk Management for this caper. Click 'Start', type **diskmgmt.msc**, then press Enter and it will launch. A quick word of warning here: any disk management shenanigans involve the risk of wiping your data, so watch what you click from here on out, as we won't be able to help you if you encounter problems.

Once you're in Disk Management, you'll see a list of partitions (volumes) at the top and a list of physical drives with their volumes underneath. Your laptop drive (and unless you're working with an exceptionally cramped desktop, this is really only something you'll need to do with laptops) should appear as 'Disk 0' at the bottom of that list. Let's get cracking.


Disk Management
File Action View Help
Volume Layout Type File System Status Capacity Free Spa... % Free Fault Tolerance Overhead
OS_Install (C:) Simple Basic NTFS Healthy (B... 90.50 GB 72.76 GB 80 % No 0%
Storage (D:) Simple Basic NTFS Healthy (L... 48.45 GB 48.36 GB 100 % No 0%
Disk 0
Basic
149.05 GB
Online
10.00 GB
Healthy (Recovery Partition)
100 MB
Healthy (Active,
OS_Install (C:)
90.50 GB NTFS
Healthy (Boot, Page File, Crash Dump, Prim
Storage (D:)
48.45 GB NTFS
Healthy (Logical Drive)
Unallocated Primary partition Extended partition Free space Logical drive
01

The Disk Management tool will show you your current physical drive configuration, including how your drive/s are partitioned.

01 BACK UP ANY EXCESS DATA

The first thing you're going to have to do is have a look at the volumes. If you're running Windows Vista or 7, you'll see at least two volumes: one 100MB 'system reserved' volume and another (probably your C: drive) with 'boot' somewhere in the description line. You may find other volumes, too, such as our test system's 10GB recovery partition. In our case, we're going to copy that across, too. We've also got a D: partition, used for data storage.

The complicating factor here is that Windows's System Image tool, which we'll be using later on to take a snapshot of our old drive's OS, only works with a drive containing a C: partition and raw unformatted space. That C: partition will also need to be small enough to fit on your new SSD; in our case, we'll need to clear out some space and shrink the partition so it'll fit.

First, we needed to remove the D: partition and you'll need to do the same for any secondary partitions on your drive. Because we didn't want to lose any data, we plugged in a 500GB USB external drive and just copied across D:'s entire contents.

02 REMOVE UNWANTED PARTITIONS

Once you're sure you've backed up all your essential data on the D: partition (or any other excess partitions that aren't C:), fire up Disk Management again. Left-click on the partition you want to remove (such as D:) to select it, then right-click on it and choose 'Delete volume' from the drop-down menu.

Ensure you've selected the correct volume (it's almost impossible to recover a volume once you've deleted it) and then click 'Yes' to confirm the deletion. Once that's complete, the partition will be listed as free space. Right-click the partition again and select 'Delete partition' to turn it into raw free space; it'll need to be raw in order for the Windows System Image tool to work its magic later.

03 MAKE A SYSTEM REPAIR DISC

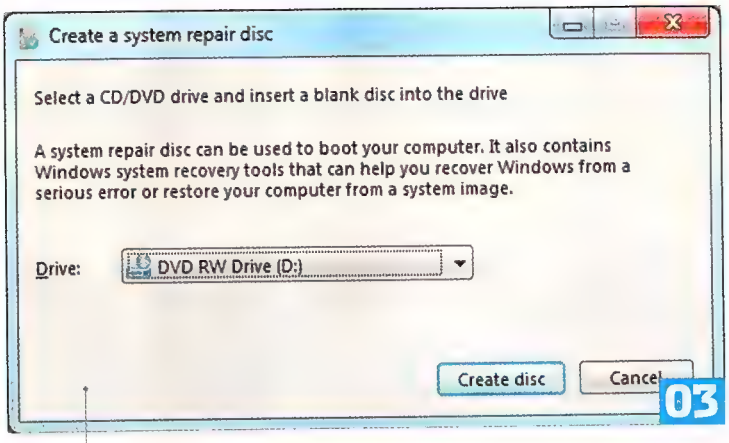
The next step is to create a bootable CD/DVD (or USB drive) that will give us access to Windows' System Image recovery tool. This is the program that'll let us restore our cloned backup of the current drive (which we'll create in a couple of steps) to the new SSD. If you've got a Windows installation DVD, it already contains the recovery tool, so you can skip to the next step. (Note that this likely won't work with a vendor-specific custom recovery disc – it has to be a genuine Microsoft Windows install disc.)

If you don't have a Windows DVD, click 'Start' and type **system repair disc** to launch the System Repair disc builder to create a bootable CD/DVD, which has the recovery tool. If you've got a Windows ISO, you can also use Microsoft's USB/DVD Download Tool (you can grab it at **tinyurl.com/c6rzjxe**) to create a bootable Windows 7 installation USB drive.

04 BACK UP C:

Now we need to get that C: drive down to a size that'll fit on the SSD; in our case, that means reducing it to less than 40GB. Windows' Disk Management tool has a built-in option to shrink volumes, but first we'll need to reduce the contents of the drive. We'd recommend backing up your entire C: drive at this point by using the Windows System Image creator (you can follow step 6 on the right). The shrinking process is pretty foolproof, but just in case it pays to have a backup.

Next, back up any essential files from C: to an external drive (as we did for D: in step 1) and delete or uninstall anything you can to bring down that total size until it (and the 'system reserved' and any recovery partitions) will fit on your SSD.


Create a system repair disc
Select a CD/DVD drive and insert a blank disc into the drive
A system repair disc can be used to boot your computer. It also contains Windows system recovery tools that can help you recover Windows from a serious error or restore your computer from a system image.
Drive:
DVD RW Drive (D:)
Create disc
Cancel
03

You'll need to create a system repair disc if you don't have an original Windows install DVD.

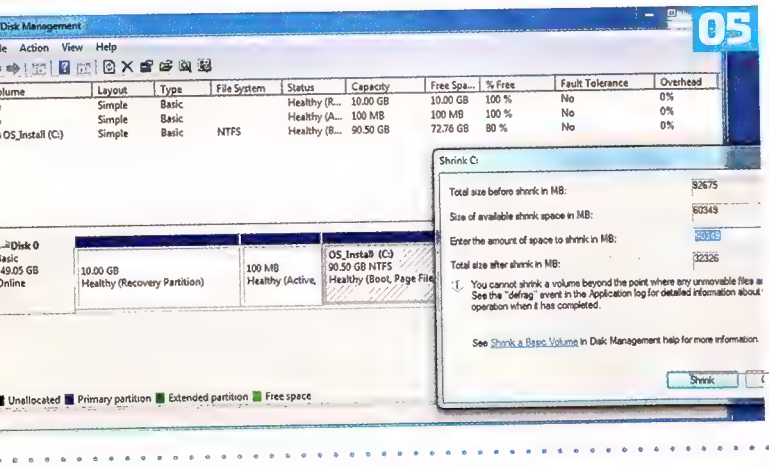
Finally, run the Disk Cleanup Wizard ('Start > Accessories > System Tools > Disk Cleanup') and then run Disk Defragmenter ('Start > Accessories > System Tools > Disk Defragmenter') on C:. This reorganises the files on C: and makes it easier for Disk Management to shrink the volume.

05 SHRINK C:

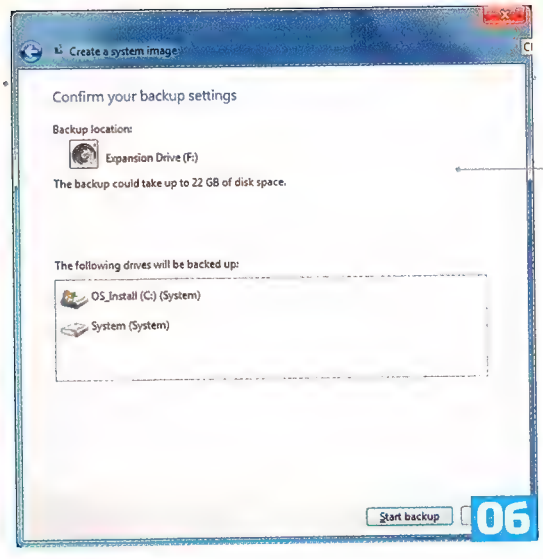
Once again, jump back into Disk Management. Left-click on C:, then right-click it and select 'Shrink volume' from the drop-down menu. Windows will perform some calculations and then display a dialogue with before and after sizes for the shrink job. In our case, we've managed to bring it down to just over 32GB, which is more than enough. If you're still over your limit, you'll need to find some more files or applications you can delete or back up and then run the shrink tool again. Once you're happy, click the 'Shrink' button to continue.

06 MAKE A SYSTEM BACKUP IMAGE

For this step you'll need your external drive again. Plug it into a USB port, click 'Start', type **backup and restore** and then click the 'Backup and restore' link. In the new window that opens, click 'Create a system image' (aka a clone) and choose to save it to your USB external drive. Click 'Next' and you'll be shown the partitions that will be backed up in the image – this should include your main OS drive (C:) and the small 'system reserved' partition. Finally, click 'Start Backup'.


Disk Management
Action View Help
Volume Layout Type File System Status Capacity Free Spa... % Free Fault Tolerance Overhead
OS_Install (C:) Simple Basic NTFS Healthy (B... 90.50 GB 72.76 GB 80 % No 0%
Simple Basic Healthy (R... 10.00 GB 10.00 GB 100 % No 0%
Simple Basic Healthy (A... 100 MB 100 MB 100 % No 0%
Disk 0 Basic 149.05 GB Online
10.00 GB Healthy (Recovery Partition)
100 MB Healthy (Active,
OS_Install (C:) 90.50 GB NTFS Healthy (Boot, Page File
Unallocated Primary partition Extended partition Free space
Shrink C:
Total size before shrink in MB: 92675
Size of available shrink space in MB: 60349
Enter the amount of space to shrink in MB: 60349
Total size after shrink in MB: 32326
You cannot shrink a volume beyond the point where any unmovable files a
See the "defrag" event in the Application log for detailed information about
operation when it has completed.
See Shrink a Basic Volume in Disk Management help for more information.
Shrink
05

If your new SSD is smaller than your old hard drive, you'll need to shrink the data and Windows partition to fit on it.



Windows has a built-in system imaging tool that will let you back up your current OS installation and restore it to your new SSD.

07 INSTALL YOUR SSD

Now you'll need to do the physical drive swap, removing you old platter hard drive and inserting the SSD. For full instructions, see our step-by-step guide on page 50.

08 RESTORE YOUR SYSTEM IMAGE

Once the SSD is installed, you'll need to restore the system image of your original drive. Boot your PC using the disc you created in step 3. If you're using a Windows install DVD, at the first screen select your language and click 'Next', then on the next screen click the smaller 'Repair your computer' link at the bottom-left.

You'll then see the 'System Recovery Options' window; from here, click 'System Image Recovery' and follow the prompts, selecting the system image from your USB external drive (created in step 6). The recovery job should go smoothly, but if you encounter an error at this point (we've seen it happen once or twice), remove the USB drive, then reinsert it and restart the recovery job again.

09 BOOT UP YOUR NEW DRIVE

Once the restore is complete, shut down your PC or laptop, unplug the external drive and remove the Windows install or recovery disc. Turn your PC back on – it should boot from the SSD and load Windows, complete with all your old apps and settings. Windows should show a 'Found new hardware' prompt (that's your SSD) and then prompt you to reboot to complete the driver installation; do so.

10 RESIZE THE NEW DRIVE

The final step you'll likely want to take is to expand your Windows partition to use the rest of your SSD. This is optional – you could just create a second partition with the extra space – but with SSDs being so small, it's easy to run out of space on your Windows drive, especially if you're only using a 60GB or 128GB model. Once again, start up Disk Management, left-click on C: and then right-click it, selecting 'Extend volume' from the drop-down menu. Choose the full capacity of the drive, click 'Next' and finally 'Expand', and you're done! Now, you'll just need to copy any essential files you backed up from your external drive and enjoy your speedier system.

PLAYING CARDS

The best gaming cards of 2012 have landed and with the year's biggest game releases just around the corner, there's never been a better time to upgrade. Bennett Ring uncovers the best cards for any budget.

With Microsoft and Sony eager to squeeze every last ounce of profit out of their aging consoles, the ever-evolving PC has once again regained its throne as the most powerful gaming platform. PC gaming is absolutely booming in 2012, with the likes of Electronic Arts claiming it as its second biggest market, not to mention the fastest growing. If you want the most eye-popping graphics, vastest virtual worlds and dastardly deep gameplay, the PC is where it's at.

Unfortunately, the beige workstation you built back in 2007 to run that year's release of Excel simply isn't going to cut the mustard. Nope, you need a gaming PC, which means three things: a decent CPU, plenty of memory and a graphics card. Thankfully, CPU performance seems to have stagnated in recent years, so any quad-core chip running around the 2.6GHz to 3.4GHz mark should be more than capable. Ditto with memory, where capacity is definitely more important than frequency – 4GB is plenty for most games.

Graphics cards sadly aren't quite as simple, with dozens of different varieties all claiming to offer the best gaming experience. We're here to help you figure out which one you want, but rather than focus on product names or gigaflops, we're talking in terms your wallet will understand: price points.

PREMIUM CARDS ($400 TO $700)

Hey there Mr. Moneybags, welcome to the premium range of graphics cards. You're obviously somebody who spends a large chunk of their free time – not to mention income – on their passion for video games.

You want to see the latest games pushing DirectX 11 to its limits with cutting-edge graphics engines in games such as *Battlefield 3*, *Sleeping Dogs* and *The Secret World*, and you want to run every setting at Ultra. Terms like 'hardware tessellation' and 'screen space ambient occlusion' make perfect sense to you and your monitor has at least 1,920 x 1,080 pixels. You might even have several monitors. If you're spending this much on a graphics card, you'll also want a fast CPU to back it up – any quad-core chip with a load frequency over 3.2GHz should suit your needs.

MID-RANGE CARDS ($200 TO $399)

Good day to you Monsieur Mainstream, let us introduce you to the most value-packed offerings on the graphics card market. You probably devote a healthy amount of time to playing PC games, but prefer to spend your money on more important things, such as food or a mortgage.

You realise that you can still play all of the newest PC games on these cheaper video cards, but you're quite happy to lower the detail settings to Medium, knowing full well that your graphics will still wipe the floor with any console. Your monitor is possibly 1,920 x 1,080, but there's also a good chance it's slightly smaller, or you're even piping it to a 720p TV. CPU-wise, a mid-range offering will do the job nicely with your mainstream graphics card.

BUDGET CARDS ($199 OR LESS)

Just because you pay less for your hardware doesn't make you any less of a gamer. It's just that you don't need eye-blasting graphics to have a good time. You tend to prefer to play older hits such as *Call of Duty: Modern Warfare* or *World of Warcraft* instead of the latest and greatest, or you might even have a fetish for retro games.

You understand that your budget gaming rig with its dated CPU won't handle the shiniest new games on the market at the highest settings and you're quite OK with that. There's a very good chance your monitor is one of those perfectly usable 1,280 x 1,024-pixel jobs that doesn't have that new-fangled widescreen rubbish all the young kids are yammering about.

SHOGUN 2 PERFORMANCE

You might notice that Nvidia cards didn't perform so well in the *Shogun 2* benchmark, with the exception of the new GeForce GTX 660 Ti. It's not because they're bad at the benchmark, but is caused by a driver bug, which had been resolved in the review drivers for the GTX 660 Ti. A publically available driver should be ready by the time you read this, propelling all of Nvidia's cards back into the lead over their AMD-powered competitors.

STREET PRICING

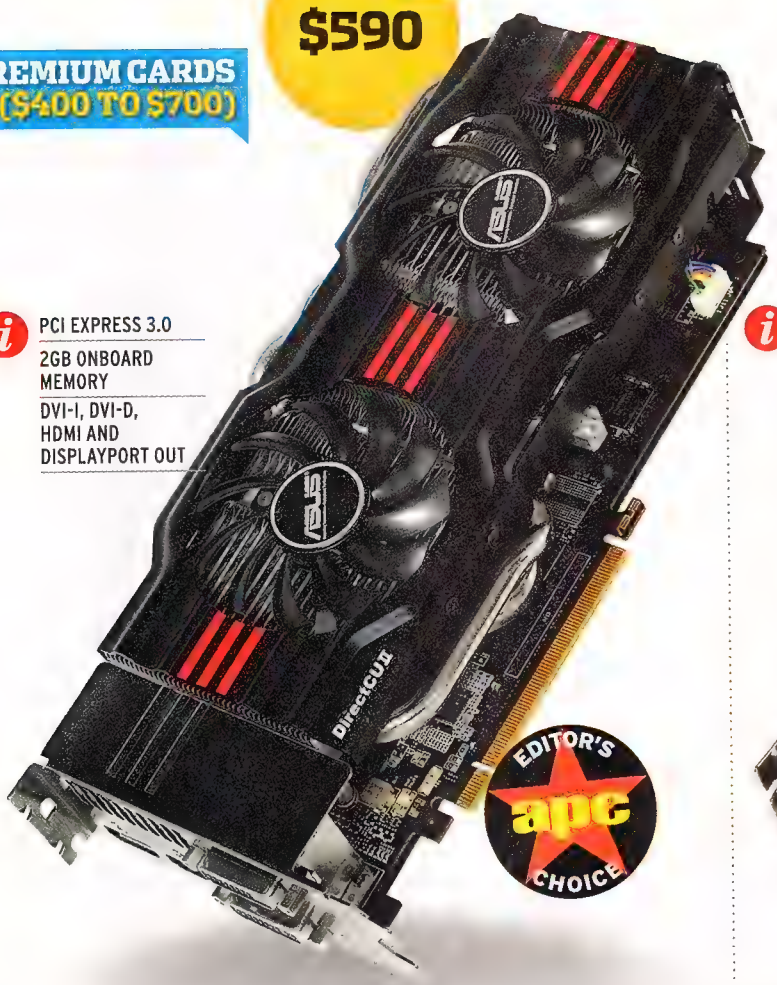
For fairness and accuracy, we've gone with street pricing for the products reviewed in this article. While recommended retail prices are lovely, they're often way out of touch with reality. To calculate realistic street price, we found the five lowest prices for each card on **www.staticice.com.au** at the time of writing, dropped the cheapest (which is usually a con to get you to order a card that's not actually in stock) and then averaged the next four cheapest prices. It's almost scientific!

BUDGET CARD GRAPHICS DETAIL

We thoughtfully lowered the graphics detail when testing the cheapest bracket of cards. It'd be too cruel to put these kiddies of the GPU world to work in the same conditions as their more expensive parents. As a result, please note that the benchmark results aren't directly comparable between the sub-$200 products and the previous two segments.

9/10

$590



- PCI EXPRESS 3.0
- 2GB ONBOARD MEMORY
- DVI-I, DVI-D, HDMI AND DISPLAYPORT OUT

ASUS GTX670-DC2T-2GD5

The GTX 680 gets a nip and a tuck.

@ www.asus.com.au

✓ Most of the performance of a GTX 680 at a cheaper price.

✗ Around $100 more than the cheapest GTX 670s, with identical performance.

We're big fans of the GTX 670 GPU used at the heart of this video card. It's nearly identical to the chip inside the GTX 680, but with around an eighth of the important stuff disabled. It's basically a V8 engine running on seven cylinders. Cards that use this GPU tend to be more affordable than this ASUS version, but as usual, ASUS delivers a premium variant.

One benefit to disabling the extra cylinder is that the card doesn't get so hot, which means it can overclock even better – if you don't mind tweaking, it's easy to get almost identical performance to a GTX 680. ASUS has already done most of the work for you, overclocking this card to hit a maximum frequency of 1,201MHz, making it 50MHz faster than the ZOTAC GTX 680! This is possible due to the stupidly big heatsink used, which unfortunately knocks out a whopping three expansion slots on the back of your case. We appreciate the cooling, but a three-slot cooler is one slot too many. ASUS has also decked the card out with a few other features that the liquid nitrogen overclocking crew will find awesome, yet the vast majority of us can happily ignore.

As expected, performance was breathtaking, albeit around 10% slower than the similarly priced Sapphire Vapor-X HD7970 GHz in *DiRT 3*. But factor in those amazing 3DMark 11 results and we're comfortable saying the GTX 670 is the better option for those who want a card that will still be relevant when Skynet takes over. Offering most of the performance of the GTX 680 at almost $100 less, the GTX 670 is our favourite high-end piece and this is a very respectable, if somewhat pricey, version.

7/10

$415

- 2GB ONBOARD MEMORY
- CUSTOM WINDFORCE 2X COOLER
- DVI-I, DVI-D, HDMI AND DISPLAYPORT OUTPUTS

Gigabyte GV-N66TOC-2GD

Shiny and new, including the price.

@ www.gigabyte.com.au

✓ Excellent performance at lower res/antialiasing, very quiet, overclocks well.

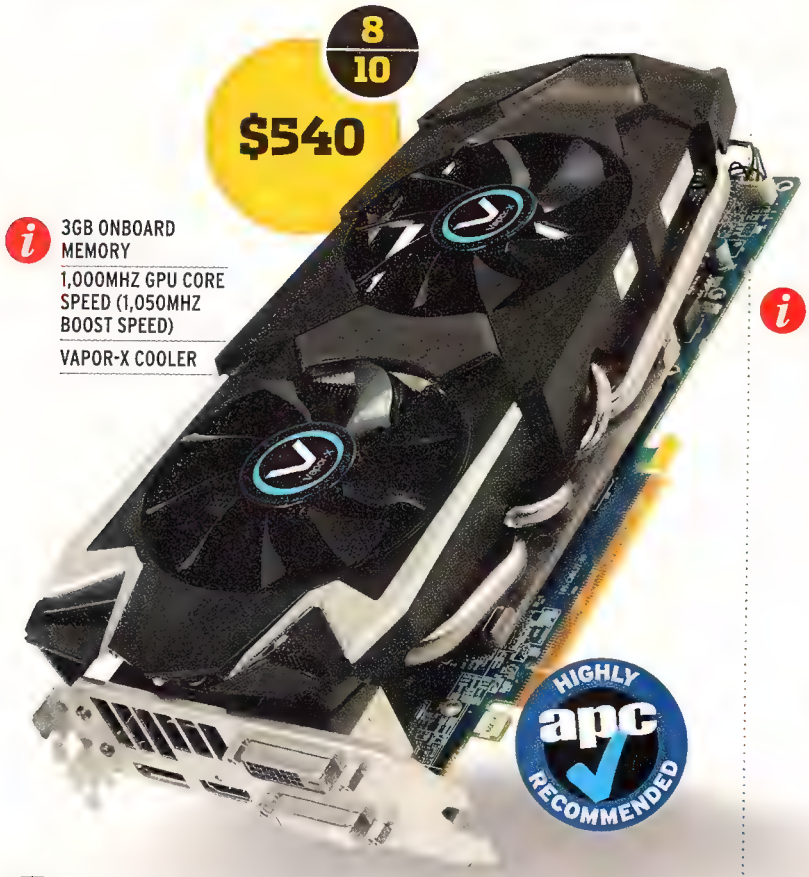
✗ Inflated price due to recent launch.

Welcome to the latest member of the Kepler family and the sibling that will undoubtedly prove to be the most popular. This brand spanking new product uses the same GPU as the GTX 670, but with one minor alteration: the memory bus has dropped a little, from 256 bits wide to 192 bits. What this should mean is a 25% drop in memory bandwidth, which will probably only affect those running at very high resolution or high levels of antialiasing. For the sake of consistency that's how we tested this card – real-world users will probably drop the antialiasing a little to make up some of the performance.

Before we dig into the benchmarks, we'd like to point out that we feel a little unfair judging this card on its price. You see, extremely new products tend to be priced significantly higher than their eventual price point. Gigabyte has set an RRP of just $399 for this card; it's the retailers who have decided to crank it up to cash in on those hungry for a new product. Give it a few months and we think this product should settle around the $350 mark and at that point it'll be a much better buy.

The noise level under load won't be an issue at a low to average 44dB. As it stands, this card is basically locked into a performance dead heat with the HIS Radeon HD 7950 IceQ Turbo, with the exception (surprise, surprise) of 3DMark 11, where Nvidia's forward-looking tech puts it in better stead.

At $20 more, we think it's a safer bet to go with the GTX 660 Ti and if you can wait a few months, you'll probably save another $50 or more.



Sapphire Vapor-X HD7970 GHz Edition

By the power of gigahertz!

@ www.achieva.com.au

✓ Excellent value for money, top-tier performance in most games.

✗ Loud, average advanced DirectX 11 performance.

We're not sure why Sapphire makes such a big fuss about the fact that this card has a GPU that runs at 1GHz; the two preceding Nvidia-based products are even faster. Instead, we think Sapphire should have called this product the Sapphire HD 7970 Awesome Value Vapor-X, thanks to its remarkable price point.

Sapphire has used AMD's successful Radeon HD 7970 GPU, aka Tahiti, to power this high-end offering. Released at the end of 2011, this new GPU powered the first of the next generation of video cards and blew Nvidia's last-generation offerings out of the water.

The fact that it did so while generating more heat than a space shuttle on re-entry wasn't too much of a problem when gamers saw the amazing eye candy it was capable of. Nvidia has since caught up with its GTX 680 and 670 products, but AMD and its partners have kept these cards relevant by slashing prices.

At just $540, this card offers top-tier performance at prices almost 20% cheaper than Nvidia's best. As our tests indicate, in many games the difference is negligible and even the most anally retentive graphics addict probably wouldn't be able to spot the difference. Unfortunately, it's not quite so glowing in the few games that push hardware tessellation, but these titles are still in the minority.

Our only concern with this card is its fan noise – as you can see from our sound meter tests, it's one of the noisiest here. If you're gaming with headphones there's nothing to fear, but the rest of us might need to invest in a soundproof case.

ZOTAC GeForce GTX 680 AMP! Edition

Got more money than sense?

@ www.zotac.com

✓ Industry-leading performance.

✗ Not much faster than more affordable cards, very loud under load.

Abandon financial hope, all ye who enter here. Considering we usually associate ZOTAC with budget variants of Nvidia's cards, it's surprising to see this one as the most expensive in our roundup. Apparently the company is making a bid for the high end and what better GPU to do it with than the GeForce GTX 680, the fastest gaming-grade processor ever.

At the heart of this card is Nvidia's new Kepler design and the GTX 680 is the fully enabled variant. Designed to deliver outstanding performance under DirectX 11's most taxing environments, this GPU really shines at hardware tessellation. This relatively new technique adds a vast amount of detail to otherwise simple objects and has to be seen to be appreciated (check *The Secret World* or *Batman: Arkham City* for great examples). Unfortunately for AMD, its cards don't handle this feature quite so well, which is why Nvidia gets our nod for those who want to play the most demanding games. Even better, Nvidia designed this GPU to smash the competition without smashing your electricity bill, making these cards much quieter than AMD's rivals. Well, usually.

ZOTAC's variant arrives overclocked, with the GPU core bumped up to a 1,110MHz base speed, which then ramps up to 1,176MHz under load, while the memory is also increased to 6.6GHz. Sadly, this overclock doesn't combine well with the custom cooler, making it one of the noisiest in the test. However, as our benchmarks show, this card is an absolute killer in 3DMark 11, yet places quite close to the more affordable Sapphire Vapor-X HD7970 and ASUS GTX670-DC2T-2GD5 in our other tests. If you demand the ultimate in performance and have a lot of cash, this one's for you.

4/10

$255

2GB ONBOARD MEMORY

MINI-HDMI AND 2X DVI-I OUTPUTS

PCI EXPRESS 2.0

EVGA GeForce GTX 560 Superclocked

Kicking the man while he's down.

@ www.evga.com

✓ Healthy amount of memory.

✗ Obsolete and expensive.

Please don't blame us for including products based on Nvidia's previous generation of graphics technology – it's not our fault it couldn't keep up with AMD's ripping release schedule! Nvidia has nothing new to offer in this price point, so it's relying on older products to cover the gap, such as this EVGA GTX 560. There are still plenty of stores selling this product, too, so it's worth seeing what all the fuss is about.

Like the GTX 570 to the right, the GTX 560 is also based on the old Fermi core that first debuted in the GTX 580, although it's had even more of a beating with the hobbling stick. Around a quarter of the transistors have been disabled, leading to even lower performance. The flipside is that EVGA has overclocked this GPU at the factory, as indicated by the 'Super Overclock' sticker on the box. Closer examination reveals this to be a bit of an exaggeration, with the core speed nudged up to 850MHz from a base level of 810MHz, and a similarly tiny bump in the memory frequency.

In terms of other specs, there's 2GB onboard memory, miniHDMI and two DVI-I outputs and PCIe 2.0. But this does nothing to broaden the appeal of a card that's otherwise lacking.

Unsurprisingly, the GTX 560 just can't keep up with this year's products. It trails behind every other product in our high-detail tests, showing that Nvidia is in dire need of a product to compete at this price point. It scored just 1,115 and 1,394 average fps in 3DMark 11 on Extreme settings (2,560 x 1,440 and 1,920 x 1,080), and 34 and 51 in *DiRT 3*.

Avoid this card like the plague.

5/10

$335

1,280MB ONBOARD MEMORY

PCI EXPRESS 2.0

EVGA GeForce GTX 570

A little long in the tooth.

@ www.evga.com

✓ Nice room heater during the winter months.

✗ Outpaced by the latest generation.

There was a time when the GTX 570 was the must-have video card for cashed-up yet sensible enthusiast gamers. Offering most of the performance of the more expensive GTX 580, it was a hugely popular product well worth the Aussie launch price of around $600.

Unfortunately, that was way back in late 2010 and things have changed markedly since then. Both AMD and Nvidia have since launched their next-generation products and the poor old GTX 570 has been left floundering. Thankfully, there's been a bit of price movement to compensate, but it's still not quite enough to justify the current price tag.

The EVGA version of the GTX 570 is basically an Nvidia-built card with an EVGA sticker on it and at its heart is Kepler's predecessor: Fermi. At the time, Fermi blew the competition away for DirectX 11 performance – at the cost of doubling as a frying pan. A hot chip equals a loud cooler and by today's standards, it's still a howler.

Considering this card still costs more than AMD's new HD 7870 products, it wouldn't be unreasonable to expect better performance. Yet to do so would be a mistake, as the GTX 570 simply can't keep up with AMD's cheaper product.

This card serves as a fantastic lesson – today's technology nearly always offers markedly better performance for the same price as the last generation of similar product.

To buy this card brand new would be rather silly. While it's well worth the $200 or so they're fetching second-hand on eBay (as opposed to the $335 retail price), the new price is ludicrously high. Stay away.

7/10

$399

- BIOS UPDATE ADDS POWERTUNE WITH BOOST
- 3GB ONBOARD MEMORY
- CUSTOM ICEQ COOLER

HIS Radeon HD 7950 IceQ Turbo

AMD saves the day with a BIOS update.

@ www.hisdigital.com

✓ Excellent performance at lower res/antialiasing, very quiet, overclocks well.

✗ Not so great at DirectX 11's advanced features.

Just as the GTX 670 is a cut-down version of the GTX 680, so too is the Radeon HD 7950 a slightly hobbled variant of the Radeon HD 7970. Like Nvidia, AMD is using the same GPU as the more expensive product, but has decreased the speed and disabled an eighth of the internals. It's a cheap and effective way to offer a more affordable product, which also uses many of the HD 7970 chips that didn't make it through testing without errors.

Just as we were about to test this card, AMD dropped a mini-bombshell on Nvidia in an effort to spoil the release of the GTX 660 Ti. AMD released a new BIOS for Radeon HD 7950-based video cards, increasing the GPU speed while also introducing PowerTune technology with Boost. Overall performance leapt by up to 15% and it was a perfectly timed move, as you'll see from our benchmark results. Updating the HD 7950 IceQ was a simple matter of running a single executable file and then enjoying the speed boost. With the exception of the Nvidia-dominated 3DMark 11 benchmark, the BIOS-updated 7950 goes toe to toe with the GTX 660 Ti in every one of our tests. It's basically impossible to tell them apart... when hardware tessellation isn't an issue at least. Like the GTX 670, the Radeon HD 7950 also overclocks extremely well, offering even more bang for buck for those who don't mind getting their hands dirty.

At just under $400, this card offers outstanding value, but it might not hold up so well in the face of more DirectX 11-intensive games in the future. If you're buying for today's games it's a bargain, but forward thinkers will probably find the GTX 660 Ti the better buy.

9/10

$315

- DVI, HDMI AND DUAL MINI-DISPLAYPORT
- 2GB ONBOARD MEMORY
- PCI EXPRESS 3.0

Sapphire HD 7870 GHz Edition OC 2GB GDDR5

A blistering budget performer.

@ www.achieva.com.au

✓ Very affordable for these levels of performance, quiet under load.

✗ Not so great at DirectX 11-heavy titles.

If you've been reading all of the reviews up to here, firstly thanks, it's great to see you appreciate all the hard work. Secondly, you've probably noticed that AMD and Nvidia have based all of their high-end products on a single design, disabling sections to scale performance in lower-end products. However, now that we're in mid-range territory it's time to look at a different approach, with this Sapphire card as an example.

This is no high-end Tahiti GPU (Radeon 7970/7950) with a few units laser-cut out; instead, it uses an entirely different design codenamed Pitcairn. Just as the Nintendo Wii was dubbed 'two GameCubes duct-taped together', Pitcairn could be considered 'two Cape Verde GPUs superglued to each other', with Cape Verde being the GPU used in AMD's affordable Radeon HD 7700-series products.

Nvidia doesn't have an answer to this price point yet, which is why we had to include the older GTX 500-series cards, and as a result AMD has stitched up the competition. Sure, this card might be the slowest of the current generation of products, but it's also an absolute bargain at $315. That's less than half the price of the most expensive card here, yet offering at least two-thirds the performance, sometimes even more. Some of that performance undoubtedly results from Sapphire's factory overclock, saving you the trouble of having to tweak.

You might not be able to run every graphics setting at 11 with this card, but this is about as cheap as it gets if you want to play today's hottest games the way their artists intended. Outstanding value for money.

- PCI EXPRESS 2.0
- 1GB ONBOARD MEMORY
- DVI, D-SUB AND HDMI OUTPUTS

5/10

$75

MSI N630GT-MD1GD3/LP

Same, same, but different.

@ au.msi.com

✓ The cheapest of the lot.

✗ Old tech sold under the pretence of a new product.

Unlike every other video card series in this roundup, the GT 630 shares very little in common with its bigger brother, the GT 640. While the latter implements the new Kepler design – albeit very poorly – as far as we can tell the GT 630 is actually a rehash of Nvidia's older Fermi architecture, the same design that's found in the older GTX 560 and 570 cards that we've reviewed in this article.

In fact, it's not just a spiced-up version of the old Fermi design; this card is actually the old Nvidia GT 440 video card with a shiny new label on it. Yup, Nvidia has used rebadging shenanigans to 'invent' a new product that carries the GeForce GT 600-series name, simply by using old inventory. While it's not advertised anywhere on the card that it's wheeling out old technology, the fact that this is a PCI Express 2.0 card is a dead giveaway that it is.

So like its bigger brother, the GT 640, performance is extremely lacklustre, although it's relying on entirely different technology to displease. Of all the cards we tested, the GT 630 easily had the worst performance, to the point where we feel safe in saying that most new games would be unplayable on this product, even at middling settings. With 59 average fps in *DiRT 3* at Medium settings, 1,284 in 3DMark 11 and just 26 in *Battlefield 3*, it was the worst of the bunch.

If there is a silver lining to this cloud it's that this graphics card offers decent performance in extremely old titles for just $75. However, we'd highly recommend spending just a little more for the HD 7750 instead.

- 1GB ONBOARD MEMORY
- PCI EXPRESS 3.0
- DVI, D-SUB AND HDMI OUTPUTS

6/10

$95

MSI N640GT-MD1GD3

Nvidia's latest budget offering.

@ au.msi.com

✓ Cheaper than a bottle of Moët.

✗ Nowhere near as much fun.

At just $90, Nvidia's new GT 640 significantly undercuts both the Radeon HD 7770 and 7750 cards when it comes to pricing. Does this mean Nvidia has pulled a rendering rabbit out of its hat, using the impressive Kepler architecture to lay the smack down on AMD's bargain offerings while whipping them at pricing as well? Or has Nvidia given up at the low end, offering a bare minimum to serve only the most basic polygon pushing duties?

The first clue that hints at the answer is the design of the GK107 GPU used in the GT 640. This comprises just two SMX units, which do most of the hard work, while the full-blown GTX 680 includes eight. The second hint is the memory bus, which is just 128 bits wide and feeds lowly GDDR3 memory. Considering that every other graphics card uses GDDR5 memory, we can see that Nvidia has taken a hatchet to the memory bandwidth. The benefit of these dramatic hardware cutbacks is a much lower TDP (Thermal Design Power) of just 75W, which results in a very quiet cooler. Obviously there's a price to be paid for that attribute, though, and performance has plummeted. Even at middling detail levels this card struggled to deliver playable frame rates. In DiRT 3 it showed an average of 100 fps, the 3DMark 11 result was 2,470 and in Battlefield 3, the second-lowest (at medium setting) with 46fps.

It's disappointing to see Nvidia failing to offer any competition to AMD at the sub-$200 price range. While the price on this GT 640 is admirable, its performance is anything but.

7/10

$125

- 1GB ONBOARD MEMORY
- HDMI AND MINI-DISPLAYPORT OUTPUTS
- PCI EXPRESS 3.0

Sapphire HD 7750 1GB Low Profile

Made for mini PCs.

@ www.achieva.com.au

✓ Very small form factor, affordable price tag.

✗ Noisy under extreme load, big performance drop compared to HD 7770.

Peaking just over the $100 mark, the most remarkable trait about this card isn't its price or its performance. While it shares the same Cape Verde GPU of the XFX HD 7770, once again the silicon surgeons have shaved away a healthy share of the chip's transistors, while also dropping the operating frequency. It's still packing a gig of memory, but we doubt it's got the horsepower to know what to do with it.

What's most impressive is this card's form factor – it's absolutely tiny. The low-profile card design makes it perfect for custom PC builds or SFF cases, where full-sized cards simply can't fit. But this brings its own issues: with such a tiny cooler, the fan needs to spin faster to dissipate the heat. Our sound meter tests showed that this little tacker is also rather noisy when under extreme loads – an average 49dB – and we imagine the cosy confines of a home theatre PC case will only exacerbate this issue.

Looking at the raw specs, we expected a performance drop of around 25% compared to the HD 7770, and our benchmarks showed similar results in *DiRT 3* and *Shogun 2*. However, *Battlefield 3* saw a massive 50% drop in performance, as did 3DMark 11. Having said that, this card still has plenty of muscle to run PC games from the last few years, but we wouldn't recommend it for a dedicated gaming box.

7/10

$155

- 1GB ONBOARD MEMORY
- PCI EXPRESS 2.0
- DVI-I, DVI-D, HDMI AND DISPLAYPORT OUTPUTS

XFX Radeon HD 7770 Black Edition

Nice for the price.

@ xfxforce.com

✓ Playable performance even at 1080p, quiet cooler.

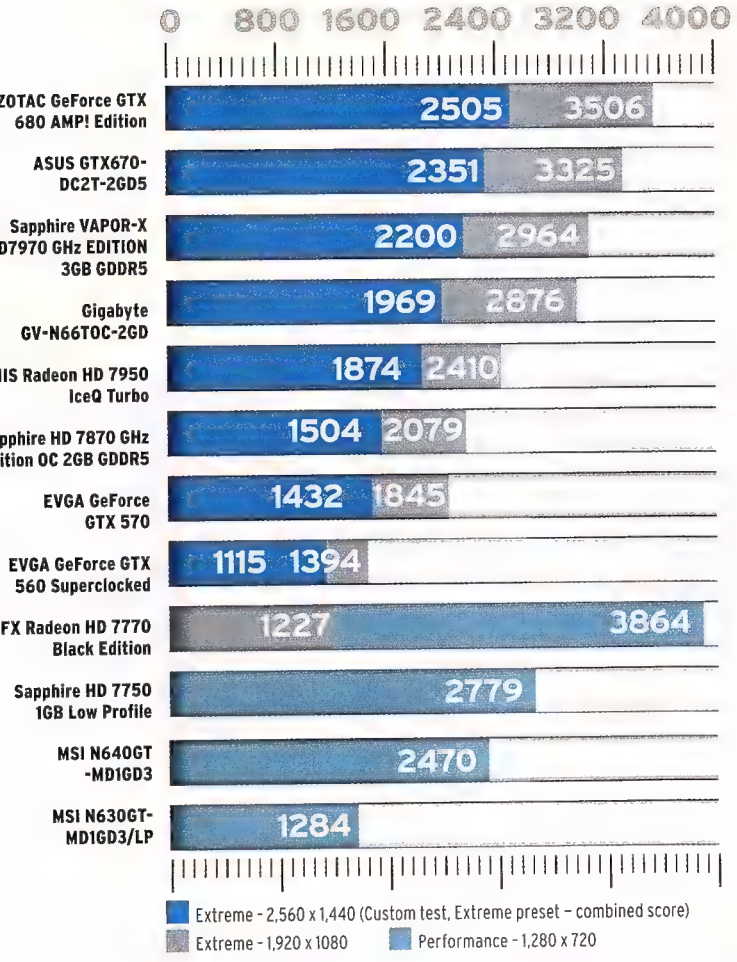
✗ You'll need to have moderate detail expectations.

Welcome to the land of the budget graphics card – it's not as grim as you might expect. AMD has thoughtfully introduced a range of new products in the sub-$200 price point that stretch the boundaries of what was once thought possible at this price, and Nvidia has returned fire with an even cheaper range. The GPU that set off this bargain war was AMD's Radeon HD 7770, which XFX has put to good use in the HD 7770 Black Edition.

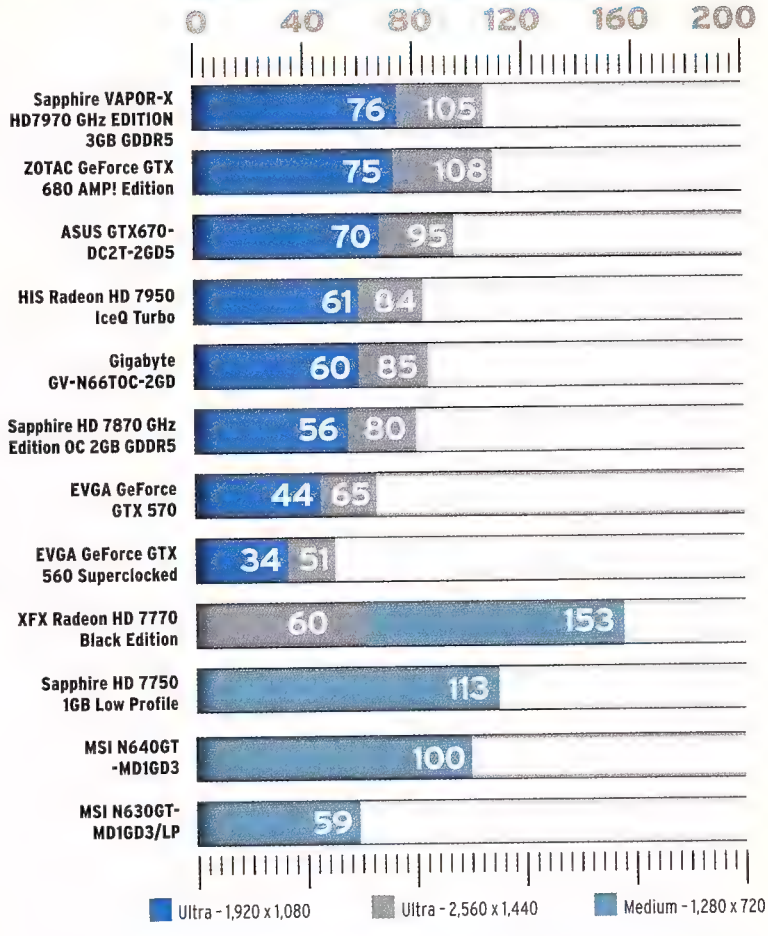
Cape Verde is the codename at the heart of this product and it's quite the beast. With the full DirectX 11.1 support of its more expensive relatives and a default core speed of 1,095MHz, XFX has put its staff overclockers to work and increased the core speed by almost 10% over AMD's designs. Clad in XFX's sexy double-fan cooler, this looks like a product worth twice the price, but the single six-pin power plug means it's more realistic.

When it came time to test this card, we were pleasantly surprised. As the most expensive of the budget cards we expected it to also be the quickest, but not by such a large margin. In fact, it even outpaced the GTX 560 when we decided to see what it could do at 1,920 x 1,080, where it showed playable performance in most of our game tests. If you're strapped for cash, but still desperately want to play 2012's biggest hitters, the XFX Black Edition is a surprisingly potent budget battler that'll do the job nicely, provided you go easy on the detail levels.

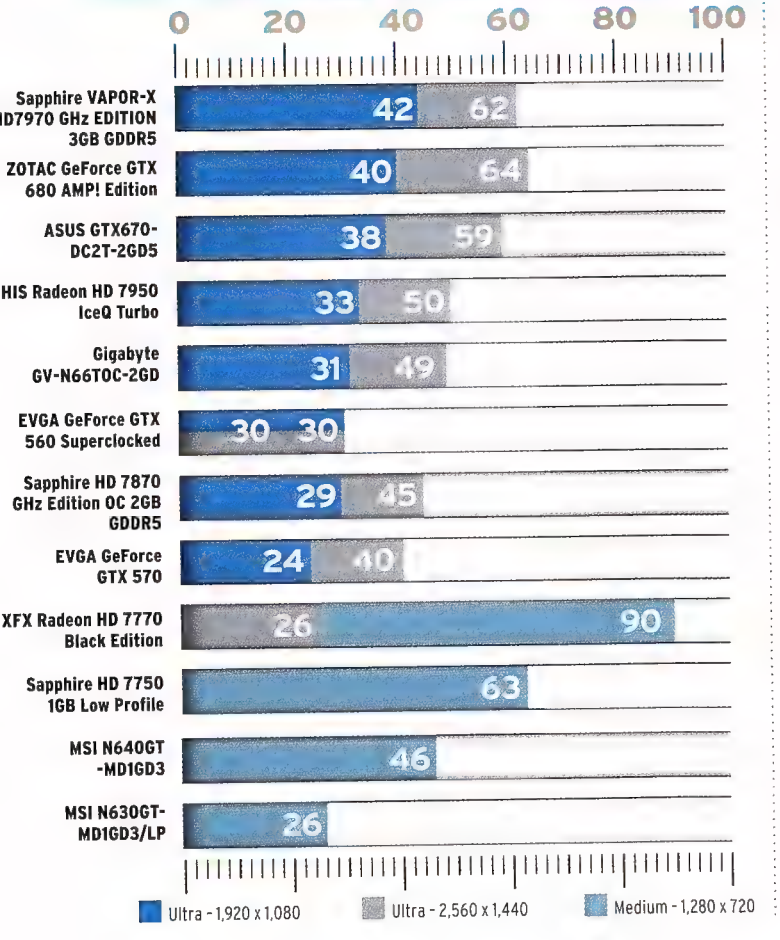
3DMARK 11



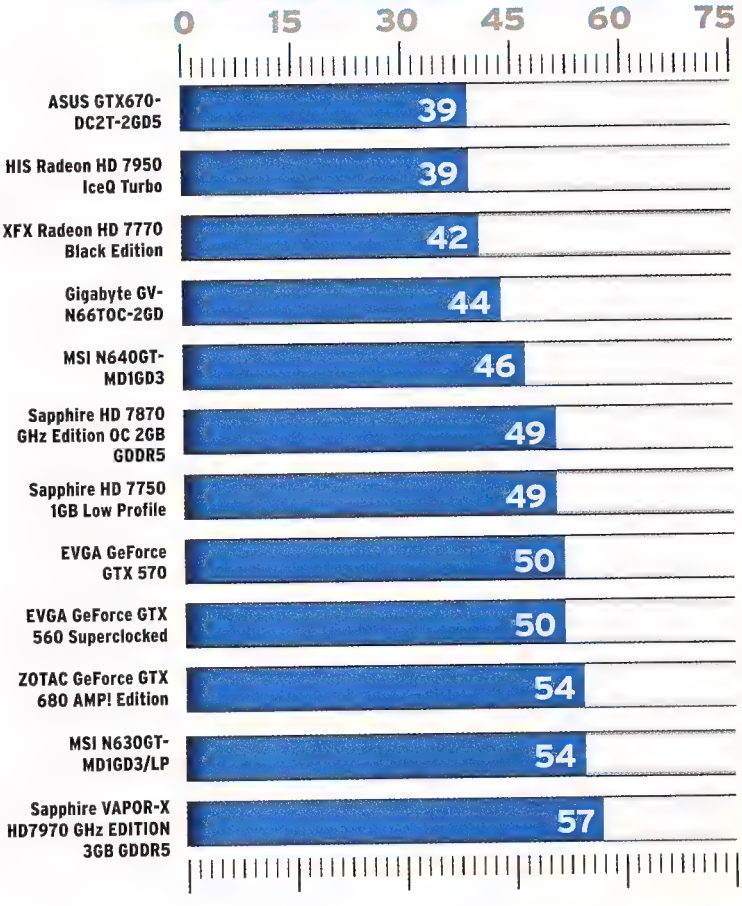
DiRT 3 – AVERAGE FPS



BATTLEFIELD 3 - AVERAGE FPS



NOISE LEVEL UNDER LOAD (DB)



MEDIA MASTERS

Looking for the right device to play media stored on your PC or server? Nathan Taylor tests 10 of the latest media streamers.

There's no question that physical discs are going the way of the dinosaurs. Most of us are now accumulating vast stores of music, videos and pictures on our PCs, and it's nice to have a way to share that media with devices in your home. A network media player does just that: it lets you watch a movie stored in your study on the TV in your bedroom or lounge room. It lets you beam your music playlist to the speakers in the back yard. And with increasing frequency, network media players are providing direct access to internet media like YouTube, VUDU, Facebook, SHOUTcast and Pandora radio, and more.

Here, we look at some of the current network media players on the market including two veterans: the Xbox 360 and PlayStation 3, which can serve as competent network media players in addition to their other functions.

DIY MEDIA PLAYERS

Like us, many users have yet to find the perfect network media player. Every appliance on the market has flaws and weaknesses, and it's still true that nothing compares to a well-built home theatre PC. If you want to build your own, there are a number of free home theatre apps available that quite simply walk all over anything built into a network media player. We suggest:

XBMC (xbmc.org). A beautifully made application that supports every protocol, codec and format you've ever heard of, and many you haven't. It also has outstanding library and media management, as well as media server features. Versions are available for Linux and Windows, and there's even a specially built XBMC Linux distribution available on the site. An Android version is coming, according to the developers.

Plex (www.plexapp.com). An offshoot of XBMC, Plex uses a client/server model and is perfect if you want to stream from your PC to mobile devices.

MediaPortal (www.team-mediaportal.com). Another fork of XBMC, MediaPortal includes PVR functionality and is designed as a quality alternative to Windows Media Center.

MythTV (www.mythtv.org). A top choice for Linux users, MythTV has incredible depth, although it can be difficult to set up.

In terms of the hardware, you can build a regular x86 PC, but recently a host of super low-cost ARM solutions have appeared, which are set to revolutionise the way home theatre PCs are built. These ARM computers can run Linux or Android, and you can then install your own media player and server apps on top of them. While an ARM processor may not be enough to decode video, typically these devices come with a GPU, which gives them enough oomph to handle even 1080p video. Some examples include:

The Raspberry Pi (www.raspberrypi.org). Available for as little US$25, the Raspberry Pi is little more than an open circuit board with an HDMI, USB, SD card slot and network port. The GPU can do 1080p H.264.

Cotton Candy (www.fxitech.com/products). A computer the size and shape of a thumb drive, the Cotton Candy has a dual-core 1.2GHz A9 processor and runs Ubuntu Linux or Android. It has an SD slot and Wi-Fi.

The Via APC (apc.io). A circuit board-style device in the vein of the Raspberry Pi. It comes with Android installed and costs US$49. It has HDMI out, SD storage, Ethernet and USB ports.

Rikomagic MK802II (www.rikomagic.co.uk). A sealed USB-style stick, it sells for £60 and runs Android 4.0. It's powered by a USB port and has microSD, Wi-Fi and HDMI output up to 2160p. Rikomagic also sells remotes and other accessories for it.

7/10

$119

ASUS O!Play Media Pro

A combination digital TV tuner and network media player.

@ asus.com.au

✓ Fast and responsive interface, digital TV tuning, has all the cables you need plus mini-antenna.

✗ Ugly, UI design leaves much to be desired.

There's unrealised potential in the ASUS O!Play Media Pro. A combination digital TV set-top box and network media player, it's fast and capable of handling just about any kind of format. It can play from UPnP and SMB sources, it has an excellent remote control and it can stream media from an attached USB drive or flash memory to other devices throughout the home. There are even apps for Android and iOS that allow you to stream to it.

Unfortunately, it falls short when it comes to design. Both the unit itself and the software that runs it are lacking. For a start, the player looks like a router. For a consumer appliance, even a digital TV set-top box, that's a major failing.

The user interface is also weak. It's responsive enough, but it's ugly and unintuitive. It buries network media playback in the file browser, while internet media add-ins are poorly designed and can take an age to load – which is frustrating at best.

We found that the media playback was grainy in our viewing tests, and controls like fast-forward and rewind took too long to kick in. It had no problem in terms of processing – it handled our 1080p .MKV test file with aplomb – but viewing wasn't as clean as some of the other devices we reviewed, for example, D-Link's Boxee (opposite).

The ASUS O!Play Media Pro also oddly lacks PVR capabilities. Given that it has a capable HD digital TV tuner built in (for people who want to turn a monitor into a TV or who don't yet have a dedicated digital TV), it would be logical for it to allow recording, but we couldn't find any support in the box. Likewise, streaming live TV to other devices seems possible given the hardware, yet remains weirdly unexplored.

D-Link Boxee Box DSM-380

Video libraries and internet media set it apart.

@ dlink.com.au/boxee

✓ Plays everything, smooth interface, excellent library features, excellent remote.

✗ It can be very slow to load libraries and apps.

The Boxee is a network media player done right, with one or two caveats. In contrast to the rough efforts of many if its competitors, D-Link has built a great-looking device that provides an elegant experience for both local and internet media playback. Ports are kept to a minimum – the only video output is HDMI, and you have stereo RCA ports and optical digital output for additional audio. There's also a flash card reader for local storage, along with two ports for attaching USB storage.

The outstanding two-sided remote continues the minimalist aesthetic of the device itself. The top side has just three buttons and a direction pad. The bottom has a full keyboard for typing. It's not the design that really sets the Boxee apart, however: it's the software. It's consistent, capable and sleek. It has a library feature that allows you to organise all your media, add episode and movie data, and mark favourites for later viewing. It also automatically downloads movie and TV show information from the internet for you. It plays every common format the internet can throw at you, and it plays them smoothly. When we tested it, a 1080p .MKV/H.264 file played smoothly, as did an SD Xvid video.

The Boxee also supports a host of add-in internet streaming applications. It comes with YouTube, Flickr, CNET, CNN, BBC and many more, and you can add new ones later on. Thanks to the keyboard on the remote, searching for things like YouTube videos is easy. Playback of internet video was super-smooth.

The one blot against the Boxee – and it's not an insignificant one – is that the library function and internet media apps are slow. You spend a lot of time staring at a twirling loading icon as you try to find the show or movie you want to watch. It's more than a little frustrating and a nasty black mark on an otherwise excellent device.

DViCO TViX Slim S1

Not actually that slim, but a capable media player and server.

@ alsotech.com.au

✓ Excellent media playback, internal hard disk option, eSATA ports.

✗ The interface can be unintuitive and ugly, the internet services are a lottery.

We've had our issues with DViCO players in the past, but with the Slim S1 it's definitely on the right track. Let's start with the hardware. There's a lot to like here: a slot for a BYO internal 3.5in hard drive, lots of connectivity, support for USB wireless and DVD drives, as well as an optical audio output. Installing a hard drive is easy, though it's not necessary for the Slim S1 to function.

It's when we get to the software that we start to run into problems. The basic interface is excellent, with big icons and a simple overall design. It's very responsive to the remote control. But once you start drilling down, things get more complicated. The media selection and library interface looks like it was written for Windows 3.1, and doing things like changing your media source are completely unintuitive. Setting up SMB sources was painful (though it thankfully only had to be done once, since you can configure up to four sources) and play controls weren't always obvious. The remote is a little on the cheap side.

The various built-in internet services were a bit of a lottery. We had several hangs (forcing a hard reboot) when trying various YouTube options, for example. But then other services like SBS Food worked like a dream. There are quite a few services built into the Slim S1 and they're worth exploring for fun.

The media playback quality is excellent. It started and played videos of all types smoothly, from 1080p MKVs to SD AVIs. The picture quality is as good as you could hope for, and fast-forward and rewind work well (you even get super-speed chipmunk-ified audio at 2x).

In the end, the S1 Slim is a mixed bag. Its core functionality, media playback, is excellent, but it falls down on some of the details. With a little more work on the interface, it could be a real winner.

6/10

$340

DViCO TViX Xroid A1

A customised Android player that's frustratingly bug-riddled.

@ alsotech.com.au

✓ Very well-designed interface, excellent media playback, installable apps.

✗ Buggy as all heck.

Just as Noontec has done with the A9 (opposite), DViCO has recognised the potential of Android on a network media player. After all, why develop your own apps and add-ins when you can have readymade ones?

Unlike Noontec, however, DViCO didn't just slap Android on a box and declare its work done. The interface of the Xroid A1 has been simplified and customised from the base Android 2.2. And it would be great if it worked properly out of the box. Instead, several key features failed to work until we ran a firmware update. For example, the media player refused to auto-detect either our TwonkyServer or Windows Media UPnP shares. This was resolved after an update, but the fact that it didn't work on the shipped device was a major problem.

This is a shame because once the player was up and running, it actually worked pretty well. It played every media format we tried, and the playback was smooth and sharp. No artefacts or graininess detected. Next we tried apps. The App Market appeared onscreen, utterly empty. It turned out its DHCP client hadn't picked up the gateway settings of our network. We manually set an IP address and it worked. We could then access the App Market and see a total of 46 apps available (some of them Korea-specific). While this is a good thing in a way – it only shows apps that will work properly on the Xroid – the shortage of apps is disappointing and undermines one of the main advantages of Android.

Some of the design decisions are also questionable. It doesn't even go into a low-power standby mode (like a phone) when you press the power button – it does a hard shutdown and takes a long time to start up again.

The thing is, once these kinds of issues are resolved, DViCO could have a truly excellent product here. The core interface is logical, fast and attractive, and the hardware is good. It's just too bad about the bugs.

7/10

4GB: $249

250GB: $449

Microsoft Xbox 360

How does the console stand up as a media player?

@ xbox.com.au

✓ Clean UI, simple navigation of UPnP devices, it's a Windows Media Center extender.

✗ No SMB, limited codec and file format support.

The Xbox 360 has come a long way since its release back in 2005. While it supported media streaming back then, its protocol support was limited, it had no access to online services and it only really supported Microsoft's Windows Media format, which nobody on the planet (other than Microsoft) used. Many updates have happened since then. It still doesn't have wide media format support, but it ticks off the most important codecs (H.264, Xvid, Windows Media, MP3, AAC) and it plays those files smoothly, with excellent picture quality and solid fast-forward and rewind. It's very finicky about malformed and error-ridden files, however, and the Xbox 360 tends to reject anything that doesn't meet its exacting specifications.

When it comes to the picture, the power of the Xbox processor shines. The quality isn't quite as good as the PlayStation 3, but it rivals any of the dedicated players we looked at. It doesn't support standard SMB network shares, which is a pretty big oversight, but navigating a UPnP server is easy. Any detected UPnP servers automatically appear in the list of sources if you go to one of the Xbox's media players. Just select and navigate.

Microsoft has been adding a host of network media services, including ABC iview and YouTube, in addition to a selection of Foxtel channels and Microsoft's own downloadable media. Some of these (including YouTube and Facebook) require an Xbox Live Gold subscription, but most are very well implemented. Of course, the Xbox 360 still also serves as a Windows Media Center extender, remote controlling your Windows Media Center PC from your TV set. Setting aside its virtues as a console, we quite like the Xbox 360 as a network media player. It has no library functions and won't play anything exotic (such as .MKV and .OGG files) without server-side transcoding, but the user experience is clean, media playback is excellent, and you can watch and schedule video recording on your PC.

Noontec A9

Uses Android to access a host of installable apps.

@ anyware.com.au

✓ It runs Android, you can install new apps from Google Play.

✗ It uses a mouse for control, the interface is all wrong for a TV screen, doesn't properly support network playback.

Noontec is one of a growing number of media player manufacturers that have decided to exploit Android rather than install a proprietary OS. This has significant advantages, most notably the availability of thousands of installable apps on Google Play. It's Android 2.3 that's used in the A9 and the interface of the media player looks very Android-ish: the home screens, the grid of icons on the app screen, even the settings are almost unfiltered Android. Of course, this is a network media player, not a phone. The interface model doesn't work that well on a TV screen. What's more, the controller is abominable. The device we received came with a wireless mouse and dongle. We're not kidding. Who wants to use a mouse in the lounge room? You can get a remote with a keyboard, but it's sold separately for $69 (and like the mouse, uses up one of the USB ports).

In addition, the default web browser, media player and picture viewer are *horrible*. Library functions and network streaming are close to non-existent – the players are designed to play media stored on the device or attached to one of its USB ports. You *can* use the SMB file browsers on the A9 to stream over a network, but realistically, you'd best go onto Google Play and download a third-party player that supports it.

On the upside, it does have support for a wide range of codecs and files formats built in, and we had no problem playing any of our test files.

Google Play really is the saving grace of this box. It has access to the hundreds of thousands of Android apps available. Even if an app comes up as incompatible with this device, you can force an app install using an APK installer app built into the A9.

While it has potential, the A9 is severely undercooked as a network media player. Noontec needs to figure out that you can't just put an ARM processor in a box, install stock Android and call it a day.

Noontec Movie Home V8 NAS

A versatile combined NAS, USB drive and network media player.

@ anyware.com.au

✓ It's both a NAS and a media player, smooth media playback.

✗ Poorly designed and unresponsive interface, cheap remote.

A device that's at once a network media player, USB storage device and single-drive NAS, the Noontec MovieHome has a little something for everybody. As a NAS, it can share the contents of a single 3.5in SATA hard drive installed inside the box. It doesn't normally come with a drive, so you have to buy and install your own. It supports SMB and top wired networking speeds (Gigabit Ethernet), but if you want wireless, you need to grab an extra dongle for one of its USB host ports.

If you want to plug the V8 directly into a PC to copy files to it, you can, too. It has a USB 3.0 device port, which we clocked at 38.2MB/s with an installed 1TB WD hard drive over a 1GB file transfer.

Connected to a TV, it can also play media stored on its drive or over a network from UPnP and SMB sources. One thing that Noontec really gets right is its support for a wide variety of codecs and file formats. It played all our test files smoothly – and had no problem with fast-forward and rewind. The pictures were slightly grainy, but they were well within acceptable limits.

Unfortunately, Noontec also gets a lot wrong with this device. The TV media player interface is extremely basic and not at all consistent or logical. For example, if you want to play network media, you have to go to its file manager and manually navigate to the destination, rather than use the media player. It's also painfully unresponsive, with a long lag time between a button press on the poorly built remote and the onscreen response. It doesn't invite you to use it.

All in all, the MovieHome V8 NAS is extremely frustrating, since Noontec has some decent hardware working here. If it could hire a handful of UI designers and programmers, Noontec might have a winner here, but sadly for now it's a pass.

Sony PlayStation 3

The PS3 has grown into a solid media player.

@ alsotech.com.au

✓ Excellent picture quality and smooth playback, works smoothly with UPnP, has a built-in Blu-ray player.

✗ No SMB, no support for MKV, MOV and OGG.

As we did when we decided to test the Xbox 360, we thought it might be a good idea to also take another look at the PlayStation 3 here. After all, if you can get a console that works well as a network media player, why bother with a dedicated device?

The PS3 hasn't come as far as the Xbox 360 in that regard – it's still not all that much different from the product that was originally shipped in 2006. There have certainly been changes: the ability to play files in a sequence; the capacity to stream media from your PlayStation 3 to a PSP or to a laptop; PlayTV, which adds TV tuning and PVR features to the PS3; and VidZone on the PlayStation Store gives you access to a wide range of internet media and other apps besides. But it seems that the basic operation and interface is still the same.

That's not entirely a bad thing though – it was definitely a better media player than the Xbox 360 at release time and it still compares pretty well now. Its best feature is the excellent picture quality. The PlayStation plays both SD and HD video as smooth as silk, beautifully filtered and very fast. No other media player reviewed was as good. Like the Xbox 360, it still lacks support for .MKV, but it will play HD .WMV files.

Your only options are attached media and UPnP/DLNA servers, which it auto-detects. It doesn't support SMB or other networking protocols. It worked perfectly with our TwonkyServer and we had no problems access a Windows Media Share as well.

Navigating the PlayStation 3 is super-quick, which was very pleasant after the painfully slow press/wait cycles of some of the dedicated players like the Noontec and D-Link devices. If you just want to get to your files ASAP, nothing beats the PlayStation 3.

Western Digital WD TV Live

A low-cost and simple media player solution.

@ xbox.com.au

✓ Easy to use, plays from USB, SMB and UPnP sources, cheap.

✗ The included apps aren't very compelling.

There's an awful lot to like about the WD TV Live. It's widely available, is simple enough for your parents to use, doesn't cost much and gets the job done. The WD TV Live isn't loaded with a massive amount of features. It just has a simple remote, two USB ports and the ability to stream over SMB or UPnP – and it even remembers SMB passwords, so you only need to enter them once.

The WD TV Live worked flawlessly with our TwonkyServer. It found the server quickly and had no problems playing any of the media we threw at it. It didn't even stutter on the 1080p MKV video. The picture quality was smooth, and fast-forwarding and rewind were adequate.

The interface is quite simple – just the way it should be. If you want to watch videos, regardless of where they're stored, you scroll up or down to 'Videos'. if you want to listen to music, go to the 'Music' area. The menu can get a little deep (especially for accessing SMB shares), and for complex shares it can be a little annoying to navigate, but anybody should be able to handle it.

The box includes apps for a set of popular online services: ABC iview, YouTube, Facebook, SHOUTcast, Picasa and a few others. Barring ABC's iview (which is great), these are neither terribly quick nor useful (especially given how painful it is to 'type' using the compact remote of the WD TV), but they can help pass the time if you're super-bored. The same is true of the onboard games.

If you're looking for a simple, low-cost solution, the Western Digital WD TV isn't a bad bet at all. It doesn't have any of the fancier features of one of the consoles we've reviewed here – or even an Android player – but most people really don't need all that fancy stuff anyway.

Western Digital WD TV Live Hub 1TB

A network media player done right.

@ asus.com.au

✓ Excellent interface, internal hard drive can both share and store media, comfortable remote.

✗ No wireless built in.

9/10 $300

Although it shares a name with the WD TV Live, the Live Hub takes things to a whole different level. This really is a consumer media player done right. It's easy to use – even though it has a broad feature set – it has a beautiful interface, library features, a comfortable remote, smooth operation and wide protocol support. There's even a very cool app that lets you control the player with your smartphone.

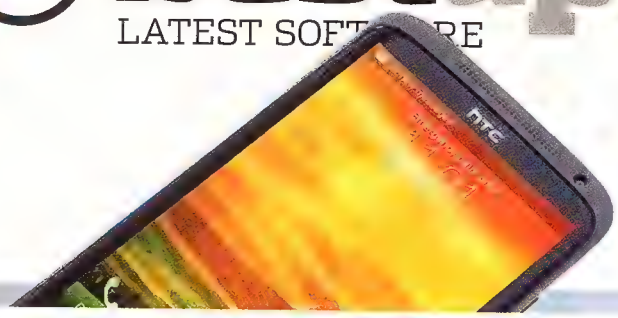
The 'Hub' part of the name comes from the integrated hard drive. The Live Hub can serve as both a client and server of media content. You can copy files to the WD TV Live Hub either from a USB device or over a network using the slightly kludgy onscreen menus. We tested it as a server using an Xbox 360 and it worked perfectly.

Media playback was smooth when we tested this device – indeed, it was smoother than even the WD TV Live. Graininess and artefacts were filtered out and it handled even the hardest file (a 1080p H.264 .MKV file) with aplomb.

Like its sister device, the WD TV Live, the Hub comes with support for a host of online services, including ABC's iview and YouTube. Using them is a little smoother on the Live Hub and you can actually plug in a USB keyboard if you feel the need to do a lot of typing (a mini wireless USB keyboard would be perfect for this). It doesn't come with a keyboard, however, nor a wireless USB adapter or even an HDMI cable. All of these need to be bought separately.

NETWORK MEDIA PLAYERS: HOW THEY COMPARE

	ASUS O!Play Media Pro	D-Link Boxee Box DSM-380	DViCO TViX Slim S1	DViCO TViX Xroid A1	Microsoft Xbox 360	Noontec A9	Noontec MovieHome V8 NAS	Sony PlayStation 3 (Slim)	Western Digital WD TV Live	Western Digital WD TV Live Hub 1TB
HARDWARE										
Storage	None	None	Optional hard drive (user-supplied)	Optional hard drive (user-supplied)	4GB or 250GB	4GB flash	Hard drive (user-supplied)	160GB or 320GB	None	1TB hard drive
Wired networking	Gigabit Ethernet	Fast Ethernet	Fast Ethernet	Fast Ethernet	Fast Ethernet	Fast Ethernet	Gigabit Ethernet	Gigabit Ethernet	Fast Ethernet	Gigabit Ethernet
Wireless networking	802.11b/g/n	802.11b/g/n	None (supports USB adapter)	None (supports USB adapter)	802.11b/g/n (current models; older models may lack this)	802.11b/g/n	Optional 802.11n dongle	802.11b/g/n	802.11b/g/n	Optional adapter
USB	Two USB 2.0 ports	Two USB 2.0 ports	Two USB 2.0 ports (plus a device USB port and an eSATA port)	Four USB 2.0 ports (plus a device USB 3.0 port and an eSATA port)	Five USB 2.0 ports	Two USB 2.0 ports (plus a device USB port)	Two USB 2.0 ports (plus a USB 3.0 device USB port)		Two USB 2.0 ports	Two USB 2.0 ports
Card reader	SD/SDHC/MMC	SD/SDHC	No	SD/SDHC	No	SD/SDHC/MMC	No	No	No	No
Optical media	No	No	No	No	DVD player	No	No	BD-ROM	No	No
Controller	Remote	Remote	Remote	Remote	Wireless game pad and Kinect (optional remote)	Wireless mouse (wireless mini-keyboard optional)	Remote	Wireless game pad (remote optional)	Remote	Remote
HDMI/component	Yes/No	Yes/No	Yes/Yes	Yes/Yes	Yes/Yes	Yes/No	Yes/Yes	Yes/Yes	Yes/No	Yes/Yes
Composite/digital audio out	No/optical	RCA stereo audio only/optical	Yes/optical and coaxial	Yes/optical and coaxial	Yes/optical	Yes/optical	Yes/optical and coaxial	Yes/optical	Yes/optical	Yes/optical
PROTOCOLS										
UPnP AV/DLNA	Yes	Yes	Yes	Yes	Yes	No (except through third-party apps)	Yes	Yes	Yes	Yes
Windows file sharing (SMB/CIFS)	Yes	Yes	Yes	Yes	No	Yes	Yes	No	Yes	Yes
Apple AirPlay	No	No	No	No (except through third-party apps)	No	No (except through third-party apps)	No	No	No	No
OTHER FEATURES										
Web browser/games	No/No	Yes/No	No/No	Yes/Yes (Android)	No/Yes	Yes/Yes (Android)	No/No	No/Yes	No/Yes	No/Yes
Online video/chat & social networking	Yes/Yes	Yes/Yes	Yes/No	Yes (Android)/ Yes (Android)	Yes/Yes	Yes (Android)/ Yes (Android)	Yes/No	Yes/Yes	Yes/No	Yes/No
Installable applications	No	Yes	Yes	Yes (Android)	Yes	Yes (Android)	No	Yes	No	No

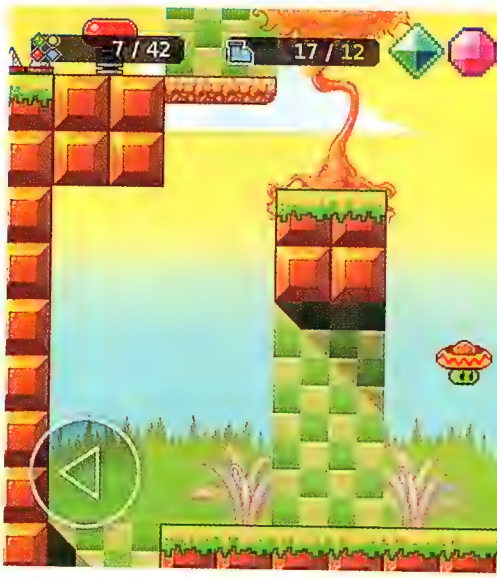


Google Play

Bean's Quest

Boingin' retro good times.

$1.99 | Kumobius | tinyurl.com/7hqtlld



You play a pixelated, stereotyped Mexican jumping bean, whose only real desire is to pick floating, pre-cut gems from a world filled with evil creatures (and the occasional axolotl).

What will Bean do with these gems? Why has nobody else thought of taking them? Who left them there? And where is everyone else anyway? Such concerns are perhaps outside the scope of this review. All I really should concern myself with is the cute retro package, complete with suitable lo-fi music and sound effects, and pixel-tastic graphics.

This is a platformer much like you've been playing for the last 30 plus years, but with a simple, touch-friendly, two-button control scheme. Y'see, this is where the jumping bean theme comes in – you're perpetually jumping. Thus, the only controls you require are 'left' and 'right'.

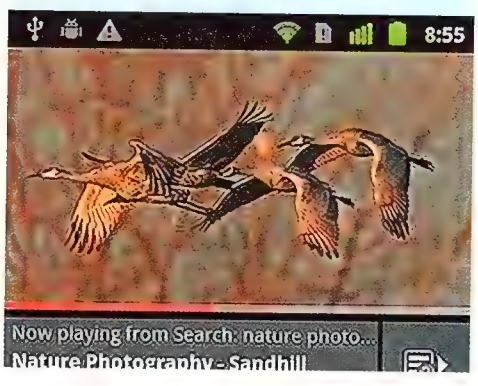
This is really the crux of the game, as it introduces challenges designed to propel you through, and onto, those magical one-way platforms, usually leaving several gems stuck in a chamber that you can never enter again.

Longevity is extended by assigning three tasks per level: collect all the gems, complete the level within a set number of bounces and find the secret axolotl.

YouTube Remote

Free | Google Inc | tinyurl.com/89mrqlp

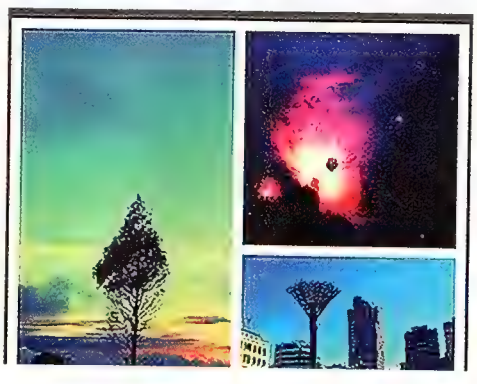
It's become common practice to have a PC hooked up to the ol' (flat panel) tube. However, web sites are often quite difficult to navigate when you're sitting so far away from the text. Google knows this and has released YouTube Remote. Install it, pair it with whatever PC you're viewing content on (just sign in to the same Google account) and you can then search, create playlists, manage the queue, pause, skip and so on, all from your Android smartphone. No squinting required – your crow's feet will thank you.



PicFrame

99c | ActiveDevelopment | tinyurl.com/8jaxde9

Take a pic, stick it in a frame! Got more pics? No problem, there are plenty of frames here. In fact, you can slap up to five images together into a single divided frame that's perfectly collated to best represent that most precious memory/lunch. You also get to choose the roundness of the corners and the colour or pattern of the borders. You can minimally play with some filters, but best results will be realised by then sharing the image to your favourite retro-trendy photo editing app of choice.



Backgammon

$1.52 | AI Factory Limited | tinyurl.com/8qr6tjm

Backgammon is perhaps, when compared to chess, seen as a sort of underdog of the ancient board games, but I really like it. With the seemingly universal brown leather-and-corduroy carry case, the satisfying weight of those round discs and that unmistakable sound of dice jiggling in cups, I have many happy memories associated with the game. But corduroy cases aren't for everyone, so you should consider getting Backgammon for Android – you get the added bonus of being able to play by yourself.

App Store

Learn Spanish — MindSnacks

$5.49 (in-app) | MindSnacks | tinyurl.com/8nxkgx6

Learn Spanish (or French, Italian, German, Chinese or Portuguese) through gaming. It's no *Skyrim*, but it's a fun and surprisingly effective way to learn the fundamentals of a foreign language. There are 50 levels to get through in six mini-games, which will teach you more than 1,400 phrases, each of which are spoken by a native speaker. You can also track your progress, show the points you've earned, the challenges you've completed and what's required for you to level up.

WhoSampled

$2.99 | WhoSampled | tinyurl.com/99festy

Sampling music is an integral part of contemporary musical culture. The best artists so completely transform the samples they use that they create something entirely new and often difficult to recognise. This is where WhoSampled comes in – it will tell you the original samples that comprise your favourite tracks, any tracks you own that have been sampled in other music and what songs have been remixed or covered. It even integrates with the music player app so you can find out all about a song as you listen to it.

Magic 2013

$10.49 (in-app) | Wizards of the Coast | tinyurl.com/8ca4c7k

I really loved the card game, *Magic: The Gathering*, throughout high school (OK, and university, too). But time moved on and my decks are now probably sitting in the dusty corner of an op shop somewhere. So I was more than a little happy to find out that I could start playing again, without having to fork out for decent decks and without having to find a fellow player. The new Planeswalker was initially a little bit of a trip, but things change. There's no point complainin'.

Stamped

Found something rad? Stamp it!

Free | Stamped, Inc. | tinyurl.com/8knnucl

Stamped is a new(ish) social recommendation service. You place a 'stamp of approval' on your favourite things, whether it's a restaurant, album, book, movie, TV show or app, and your followers then know, through your clearly universal ethos, that this item is worthy.

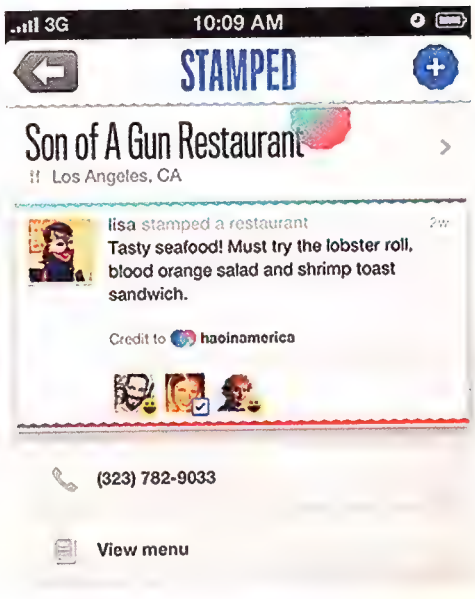
So, if your brother-from-another-mother stamps a restaurant, you know that the recommendation means something more than the 70 anonymous star ratings on Yelp.

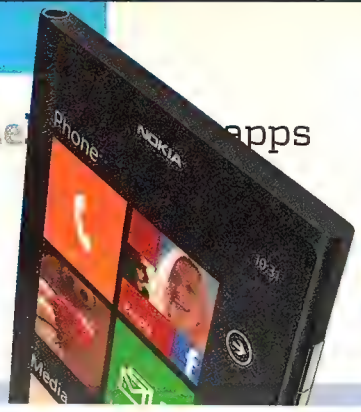
Of course, you can also follow celebrities, but you never know how genuine such recommendations are, so I'd probably take their stamps with a grain of chicken salt.

The app is divided into two main sections: 'The Feed', which shows a list of the latest stamps from the people you follow, and 'The Guide', where you pick a category and view the top recommended or nearby products and who stamped them.

Best of all, the app integrates with Amazon, OpenTable, Fandango, Netflix, iTunes, Rdio and Spotify, so you can make reservations, view menus, buy books, get movie tickets and listen to songs, all through the app.

The key to the whole concept here is that, in a crowded product recommendation space, Stamped is taking a page from Instagram and aims to reign supreme by being as quick and simple as possible.





Windows Store

Call of Carlos

Tilt and tap your way to magmatic freedom.

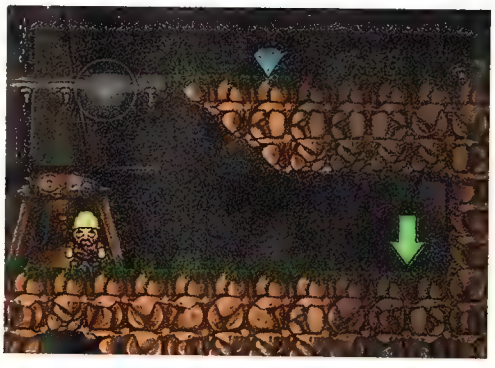
Free | Games Academy | tinyurl.com/8n99b76

Carlos is a simple fellow who loves two things: gems and digging for gems. He recently stumbled upon a mine that is seemingly jam-packed with gems, but has one fatal flaw: it seems to frequently fill with lava. Carlos's love for gems goes so deep, however, that he's willing to brave such extremes using only his go-go gadget extendable pickaxe.

So, as his invisible overlord, you tilt your phone to force Carlos to stumble left or right and tap on the screen when you want him to extend his little grab-o-licious pickaxe and pull himself forward. There's no jump as such – you need to fling him using his pickaxe and move him (in the air or on the ground) by tilting your phone. You must do this quickly, though, as that lava fills up the mineshafts at an alarming rate, particularly in the later levels.

This is a one-handed game that probably benefits from smaller (as in, not 4.3in) screen sizes, as it becomes difficult to stretch your thumb out to touch some of the required grapple points.

To help in replayability, there are three goals per level. It's addictive, creative and most importantly, you get all this for free.



Freda

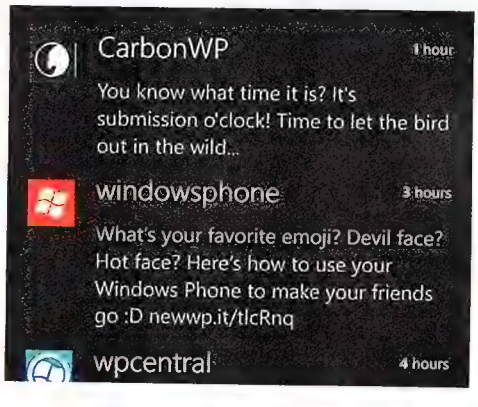
Free | Turnipsoft | tinyurl.com/8m34ook

Everybody needs an ereader – don't argue with me here. As supporting the standard EPUB, FB2, HTML and TXT formats, Freda can read them from your SkyDrive, Dropbox or Calibre library. It also supports online catalogues like Feedbooks, Smashwords and Project Gutenberg, or distribution web sites like O'Reilly Media. The program offers customisable controls, fonts and colours, plus annotations and bookmarks, as well as the ability to look up dictionary definitions and translations. Best of all, it's free.

Carbon

$2.49 | Yalla Apps | tinyurl.com/8grmbps

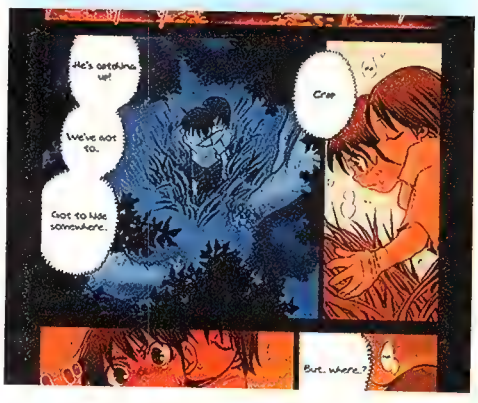
The Twitter client Carbon has a sleek Metro UI, great gesture support (two-finger tap to retweet/quote), multiple account support, read later, inline photo and video previews, custom URL shortening and a handy 'Compose' tile so you can tweet right from your home screen. It also has a handy 'Quick Line', which brings all your lists, saved searches and retweets together into a single timeline. The biggest omission in that list is push notifications – well, the devs assure us that said is coming 'real soon'.


CarbonWP
1 hour
You know what time it is? It's submission o'clock! Time to let the bird out in the wild...
windowsphone
3 hours
What's your favorite emoji? Devil face? Hot face? Here's how to use your Windows Phone to make your friends go :D newwp.it/tlcRnq
wpcentral
4 hours

Lindy Comics

99c (ad-free) | Lindybeat | tinyurl.com/9c9l8pl

Comic books are cool and they're kinda cooler when you have all of them in your pocket. Lindy Comics reads the popular CBR and CBZ formats, and brings with it pan, zoom, pinch, fit to width, fit to page and quick navigate through the pages. It also has Dropbox support (with a download queue that runs while you read), so you don't have to worry about keeping all your comics on your phone all the time. The trial version of the app is ad-supported, but the 99c version removes these.

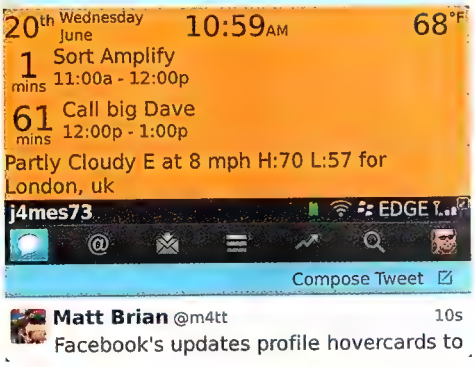


App World

Amplify

US$4.99 | MLH Software | tinyurl.com/8qbygte

Amplify allows you to access a handy little status bar from any app installed on your device by simply pressing an assigned hardware button. The status bar can contain information such as the time, date, calendar appointments and weather. Better yet, while the status bar is displayed, you can then use keyboard shortcuts to do tasks like create calendar appointments or navigate to a new app. So it's both a handy status bar and great a way to assign keyboard shortcuts to common tasks.



PicStory

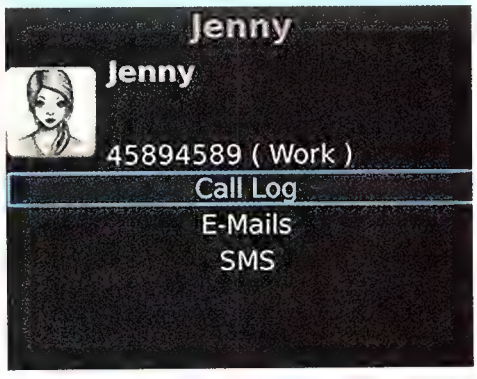
Free | Risto Mobile Solutions | tinyurl.com/8rwnado

PicStory has a wealth of filters, layouts and frames for your images. It's sort of like Instagram in that it includes a social network, but rather than just supplying filters you can also choose frames and layouts, combine images together to create collages or add text and other effects. The biggest drawback is the shameless self-promotion watermarked onto the bottom of each created image, but this is the next best thing to Instagram on BBOS.

Stealth Book

US$1.99 | Oswald Designs | tinyurl.com/9rv4r34

If you're wrestling with a serious case of paranoia (or perhaps those suited men really are after you), Stealth Book allows you to hide from your handset any evidence of correspondence with specific contacts, in the form call logs, SMSs and emails. Severe paranoia? You can also have the app hide all evidence of correspondence with anyone, including making all of your contacts private. The app itself doesn't even include an icon – you launch it with a super-secret, custom button combo, James Bond style.



DOSBox

All the retro gaming goodness you could possibly desire.

Free | A7omic Apps | tinyurl.com/8fsskmg

I'm a bit of a sucker for retro gaming – the blocky graphics, the electronic sounds, the sweet stink of nostalgia... I love it all. So I'm more than a little excited that DOSBox – emulator of everyone's favourite command line OS of yore – has now made it to the PlayBook.

Yes, you can now go planet exploring with *Commander Keen*, destroy the evil cult in *Rise of the Triad*, escape the dungeons of the *Prince of Persia* or explore the contents of directories with **dir** .

Unfortunately, you really need a Bluetooth keyboard and mouse, as the onscreen keyboard isn't really helpful, although the touchscreen serves as a mouse pointer. You can change the touch control schema to add in your own onscreen controls with a little tinkering.

Of course, this is just an emulator, so you'll have to dig out your old floppies to get the original files or check the torrents for any (legitimately distributed) shareware games.

I found that I could get most games running smoothly, but there are a myriad of configuration options that can help at **tinyurl.com/8oe5ejl** or **tinyurl.com/969tarf**.

You may also benefit from brushing up on DOS commands at **tinyurl.com/g216**.

TURING & HIS MACHINES

It's Alan Turing's 100th birthday this year, but what exactly are the computing machines he invented?

If you consider the greats of computing, there would be two names at the top of the list: John von Neumann and Alan Turing. Both were mathematicians who became engrossed in the applied mathematics that is computer science and worked at a time when there were no computers that we'd recognise today.

Of the two, von Neumann is the one who's considered the founder of modern computers. He also designed the instruction set (the opcodes that performed the various operations like addition, testing values, jumping to instructions and so on) for ENIAC – opcodes that are the basis of all current sequential programming languages.

Whereas von Neumann can be said to have had his feet firmly planted in the practical world of computer science, Turing was more embedded in an academic philosophical world. He described ideas and concepts with no thought of practical implementation, but that would help him prove theorems and conclusions in the world of mathematics that he inhabited.

EARLY LIFE

Alan Turing was born in Maida Vale in London on June 23, 1912. From an early age he showed great mathematical promise – so much so that, when he attended Sherbourne School, his headmaster complained that his education would be deficient since he wasn't spending enough time with the classics.

From Sherbourne, Turing went to King's College, Cambridge, in 1931, where he studied mathematics. He was awarded a first-class honours degree in 1934. A year after graduating he was made a fellow of the same college, based on an original proof of the central limit theorem. In 1936, he published the first of the papers that would define him and his works:

add	0	1	right	return
add	1	0	left	add
add	blank	1	right	return
return	blank	<no change>	left	start
return	0	<no change>	right	return
return	1	<no change>	right	return

State table for the binary counting Turing Machine.

On Computable Numbers. We'll return to this paper and its fundamental invention, the Turing Machine, in a moment.

From 1936 to 1938, he studied under Alonzo Church, the inventor of the lambda calculus (now very much used in functional programming languages) in Princeton, New Jersey, earning his PhD. During this time he started to become interested in cryptography – work that would draw him to working at Bletchley Park during World War II, with particular focus on the German Enigma cryptography machine. Turing was instrumental in analysing the patterns produced by the Enigma Machine statistically and devised techniques based on those results, which would help in cracking encoded messages. So advanced were the papers that resulted from these analyses, they remained secret until 2012.

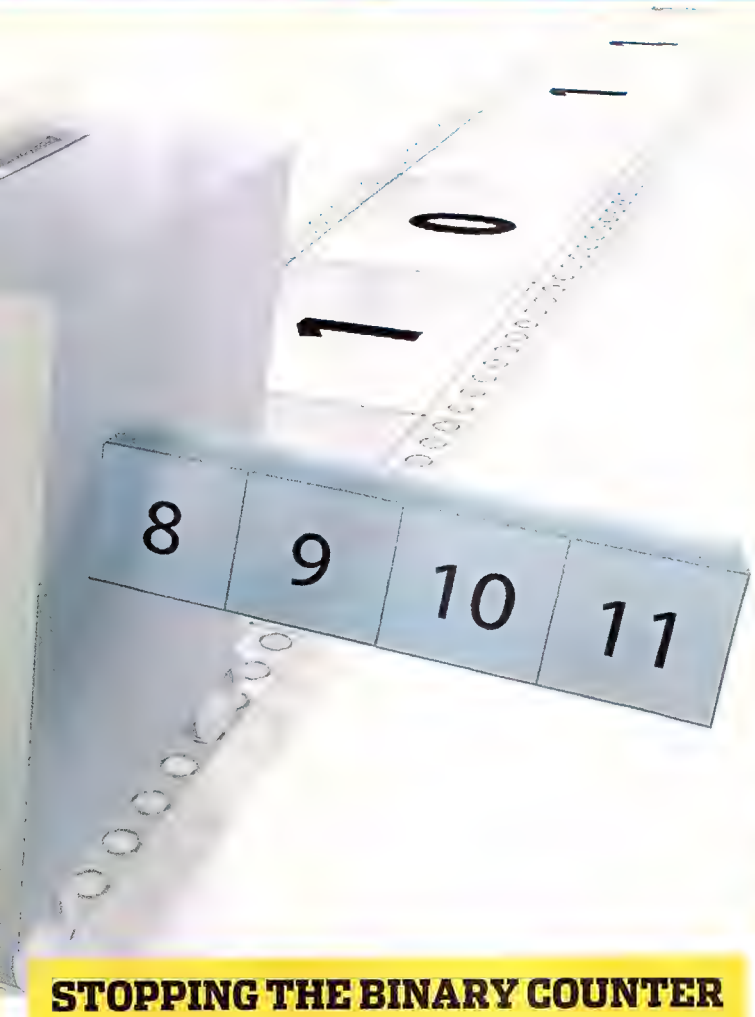
AFTER BLETCHLEY PARK

After the war, Turing worked on his own concepts for a computer that stored its own programs, but because of his top-secret work at Bletchley Park, those papers weren't widely known or acted on. In the late '40s, Turing moved to the University of Manchester, where he explored what could be meant by machine or artificial intelligence (again, at a time when computers were very few and far between).

It was this work that led to the 1950 paper, *Computing Machinery and Intelligence*. In this paper, Turing addressed the problem of defining whether a machine could be considered to think or not. The principal issue with this problem is the word 'think'. What is thinking and how do we recognise it? Can we construct an empirical test that conclusively proves thinking is going on? From this discussion, he evolved the idea that became known as the Turing Test.

He approached the solution by considering a party game called the Imitation Game. In this game, a man and a woman go into separate rooms, so the rest of the guests don't know which is which. The guests send the subjects written questions and get typewritten answers back. From the series of questions and answers from each subject, the guests try to determine which one is the man and the woman. Of course, the subjects can try to muddy the waters by pretending to be each other.

From this basis, Turing then considered what would happen if the man or the woman were replaced with a kind of machine intelligence. Would the guests be able to guess the machine versus human more accurately than they would the man versus the woman in the original game? Turing's insight then was to rephrase the 'Can machines think?'



STOPPING THE BINARY COUNTER

The Turing Machine that counts in binary doesn't stop. It will continue to count ad nauseam. How then should we make it halt?

We can think of two ways. First, have the tape preloaded with a sequence of 0s instead of just the one. If we have four 0s in a row, we can make the machine stop after showing 17 binary numbers. Consider the add state: if the current cell is blank, we've reached the end of the initial list of 0s. Set that cell to 1, then invent a new 'returnthenstop' state that will do exactly what the return state describes, but when it reaches the blank on the right, it'll set the new state to halt. Second is to use an extra symbol and place it on the input tape to the left of the initial 0. Make the add state check for this symbol: if reached, output a 1 to the current cell and then use a new 'returnthenstop' state to work as described above.

question into a more general 'Can machines imitate how humans think?' This is the original Turing Test, although over the years it has morphed into a situation where we try to guess whether someone we're corresponding with is machine or human.

After this work, Turing moved on to mathematical biology as a field of study, but in 1952 he was charged with gross indecency for being homosexual. After being found guilty, Turing opted for a hormonal treatment to try to cure him of his homosexuality rather than be imprisoned. This course of treatment lasted for a year and rendered him impotent. The guilty verdict meant that he was stripped of his security clearance at GCHQ, which ended his work on cryptography. In June, 1954, just over two weeks before his 42nd birthday, he was found dead from cyanide poisoning.

Since then, Turing's fame has grown, both from his work at Bletchley Park for GCCS during the war and from the two most popular of his many papers: the one that introduced the Turing Test and the earlier one that introduced the Turing Machine. We've briefly seen the Turing Test, but what exactly is the Turing Machine?

THE TURING MACHINE

Back in 1928, the German mathematician David Hilbert was trying to formulate a rigorous logical foundation for all of mathematics. In other words, given a small set of axioms (an axiom is a proposition that can be accepted as being true without proof), a mathematician could then build an edifice of theorems and their proofs, which would cover all of mathematics.

He believed this endeavour was feasible, but there were three big problems standing in his way and this is how he stated them in 1928: was mathematics complete, was mathematics consistent and was mathematics decidable? He really wanted them to be true to help in his efforts to build mathematics as a self-consistent model. Kurt Godel comprehensively demolished Hilbert's first two aspirations with his incompleteness theorems in 1930 and the third – the 'decision problem' or *Entscheidungsproblem* – remained unsolved. So he posed it as a challenge for his fellow mathematicians: can you find an algorithm that, when given a set of axioms and an input statement in first-order logic, can prove the input statement is completely valid?

Both Alonzo Church and Alan Turing attacked this problem and both proved it false – Church by using his lambda calculus and some other results from Stephen Kleene (who is perhaps best remembered as the inventor of regular languages and expressions) and Turing by inventing a 'virtual' computer, one that existed only in the mind, the Turing Machine.

Turing approached the *Entscheidungsproblem* by defining what an algorithm is. He defined it as a mechanical process (do step A, do step B, repeat step C until something became true and so on). Since a mechanical process is presumably something that can be done with a machine, Turing set about inventing a general machine that could be used to implement any such mechanical process or algorithm (not that Turing had any desire to build one).

The machine he invented consists of a device that operates on an infinite tape, or rather a tape that can be assumed to never end: there's

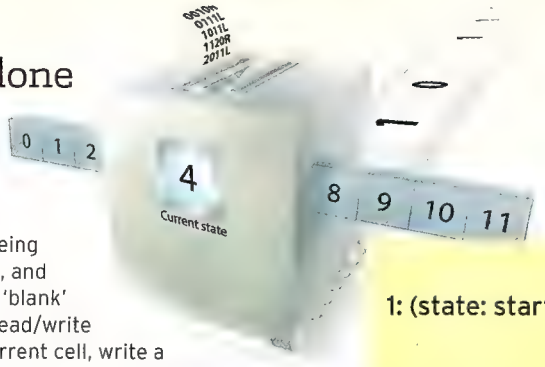
TURING MACHINES & REAL COMPUTERS

As we've seen, Turing Machines are abstract hypothetical beasts. No modern computer has ever been built as a Turing Machine, although many modern computers have been programmed to simulate such a machine. Even LEGO Mindstorms kits are enough to simulate a Turing Machine.

Turing showed that although a Turing Machine is simple to describe, it's powerful and capable enough to execute any computation a real computer can. The biggest difference is that, by definition, Turing Machines have infinite storage at their disposal with their tape. Real computers don't, although in practice, useful Turing Machines don't need infinite tape at all.

Anything a Turing Machine can compute, a real computer can as well within memory limitations (and vice versa). This is usually expressed that the language being used to program the computer is Turing complete. To be Turing complete is a fairly low bar.

In essence, the programming language can be used to simulate any other computing device; that is, it can be used to program a Universal Turing Machine. Generally, for an imperative programming language to be described as Turing complete, it must have variables and conditional branching, which are enough to simulate a Turing Machine state table.



always enough tape for the algorithm being processed. The tape is divided into cells, and in each cell there's a single symbol with 'blank' being such a symbol. The device has a read/write head that can read the symbol in the current cell, write a symbol in the current cell and move the tape one cell to either the right or left.

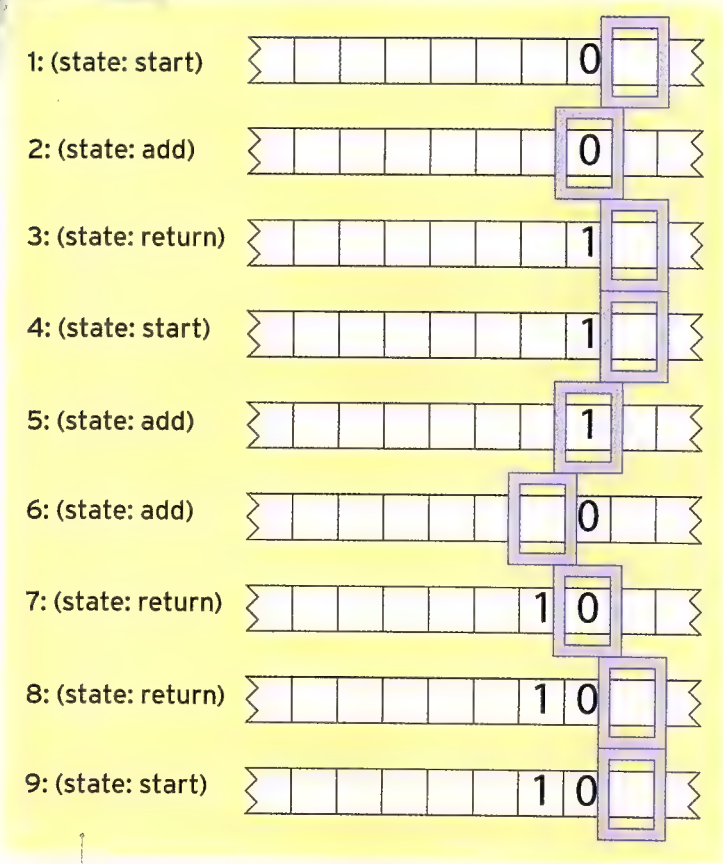
Furthermore, the device has a special register – a memory location – that stores the current state of the machine, and there's a state table or transition table that defines what the machine does next. The state table takes as input the current state of the machine and the symbol under the head, and defines what happens next: erasing or overwriting the current cell with another symbol, advancing the tape right or left (or leaving it where it is) and defining a possible new state. There's at least one state that stops or halts the machine and the computation.

Turing devised this hypothetical machine in such a way that its definition was obviously bounded. The symbols are assumed to come from a finite alphabet, the number of states is assumed finite as well, and the machine as a whole is well-defined (it can never get into a state that's unknown or undefined).

As you can appreciate, this is just a rather sophisticated state machine. Let's explore with an example: counting in binary. We'll start off with a tape with a single 0 and the head is positioned on the blank cell to its right. The state is 'start'. With the start state, no matter what's underneath the head, we move the head left one cell and set the state to 'add' because we're about to add one to the current binary number.

In the add state, we look at the cell underneath. There are three possible values. If it's 0, overwrite it with 1 and set the state to 'return'. If it's 1, overwrite it with 0, move the head left one cell and keep the state as 'add'. If the cell is blank, set it to 1, and set the state to 'return'.

Finally, in the return state, if the cell underneath is either 0 or 1, move right one cell. If it's blank, don't move and set the state to 'start' again. In essence the return state is looking for the blank cell just to the right of the current binary number. Every time the machine hits the start state we can see the next successive binary number on the tape to the left of the head. The table on page 72 shows the state table and the image at right shows the Turing Machine in action.


1: (state: start) 0
2: (state: add) 0
3: (state: return) 1
4: (state: start) 1
5: (state: add) 1
6: (state: add) 0
7: (state: return) 1 0
8: (state: return) 1 0
9: (state: start) 1 0

The first few steps of a binary-counting Turing Machine.

THE HALTING PROBLEM

Now that you've had a look at this example, you can see that there's a big problem with it. Basically, it never stops. We didn't code into the state table any way to stop the binary counting and with this simple example, it's easy to see that this is the case.

In fact, this is one of the main problems Turing considered with his hypothetical machine: given a Turing Machine and its initial input tape, is it possible by analysing the state table and the machine's symbol alphabet to determine whether the machine will halt?

If you like, is there an algorithm you can use on a Turing Machine to determine, given some arbitrary input tape, that the machine will eventually stop? In computer science, this is known as the halting problem. It's a compliment to Turing's genius that he was able to prove that it's not possible to prove whether an arbitrary Turing Machine will halt or not given some input.

In fact, Turing went even further in discussing this problem. Since a Turing Machine is fully determined by its state table, alphabet and input value, we can encode this information for a particular Turing Machine on a tape and give it to another Turing Machine. This second machine could read the input tape, execute the state table encoded on it and compute whatever the original machine was designed to compute.

Let's call the encoded state table and input value a program and its data, and we can see we've hypothesised an arbitrary computer (admittedly with an infinite tape or storage) executing a program on some data. Will it halt? The answer is, we can't tell.

This second Turing Machine is what's now known as the Universal Turing Machine. It takes the definition of another machine and executes as if it were that other machine.

But let's suppose we have the algorithm Hilbert wanted. In other words, given an input statement, this algorithm could be followed mechanically (a Turing Machine) and output 'Yes' or 'No' as to the validity of the input statement. One such statement would be 'Here's an arbitrary Turing Machine, will it halt on every input?' Turing proved that the answer is no – no algorithm can decide whether a given Turing Machine will halt. In fact, the algorithm can't even decide if it itself will halt in trying to decide if the machine will halt.

In his short life, Alan Turing provided some solid yet abstract ways to think about the world – ideas that are still widely known today. It's a shame he didn't live longer to improve them.

CHURCH-TURING THESIS

One of the problems during the first half of the 20th century was properly defining the notion of computability. This is, in essence, the ability to devise an algorithm to solve a given problem efficiently. Efficiently here means that, on a fast enough computer, the algorithm will produce answers in a reasonable amount of time for given inputs.

The answer to a 'travelling salesman' problem (one salesman has to visit N cities so that his cumulative travel is the shortest distance possible) can, for example, be shown to be extremely hard to compute if the number of cities is large, no matter how fast the computer.

The Church-Turing thesis shows that if an algorithm exists to efficiently calculate a value, the same calculation can be done with a Turing Machine, a lambda function or by a recursively definable function. Computability doesn't depend on the expression of the algorithm using a particular process: if an algorithm is computable, it's computable in all ways.

ORIGIN

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ASK US ABOUT YOUR NEW PC

Ready to build a new PC, but need an expert opinion? Darren Yates answers your questions.

THE HOLY GRAIL?

Q I want a new gaming PC to replace my old Core 2 Duo computer, but I also want to keep the price to under $800. I'm happy to keep my 22in LCD screen, but I want this computer to last me a good couple of years. What do you suggest?

David Johnson

The PC dead? Bah! That's just rubbish trotted out by those who want to sell you something else. No other computing device gives you as much performance for your dollar than a desktop PC. However, that doesn't mean it's easy to get a build just right, so in this new monthly column, we'll be answering a reader's build question, looking at the options and coming up with a complete solution that just might suit you as well. So if you have a specific system build requirement, but don't know where to begin, ask us at **contact@apctest.com**.

Designing a PC build on a budget is always a tough ask. Anyone can build a go-hard gaming PC if you throw enough money at it. The trick here is designing a build that'll last and come in on budget.

While I haven't seen David's existing PC, it'd be pretty safe to assume that if it's an old Core 2 Duo system, there likely isn't much we're going to want to keep. The fact that he needs a new system for gaming suggests the graphics card has seen better days, too. Keeping the monitor definitely helps our budget, so that's a plus, but on the whole, I think it's safer to start the system build from scratch.

WHAT WE NEED

If this is a gaming PC, the CPU and graphics card will be key elements, since gaming performance is still a function of those two components. What we don't need is what I call the 'hero' motherboard – the board that comes with all the bells and whistles, and a $400-plus price tag.

Apart from blowing half of our budget right there, the reality is that at a baseline level, the motherboard contributes little to gaming performance. Given that we don't have a huge budget here, the motherboard is the one area we can afford to cut back on quite heavily without overly impacting that performance.

Our first problem is that by the time you account for buying a new Windows 7 Home Premium 64-bit operating system disc, our budget is already down to $700, so we need to proceed carefully. Here are the components we suggest and the reasons why.

PROCESSOR:

INTEL CORE I5-3470 ($215)

Unfortunately, Intel has yet to release its entry-level dual-core Ivy Bridge-grade CPUs and I'd have been sorely tempted to go one here, but the i5-3470's quad cores should give this build plenty of life. Gaming used to be almost as much about the CPU as it was the graphics card, but with higher gaming resolution options, the graphics card takes over as the performance bottleneck, so the i5-3470 should last a couple of years, easy.

GRAPHICS CARD:

POWERCOLOR AX7850-2GBD5-DH ($245)

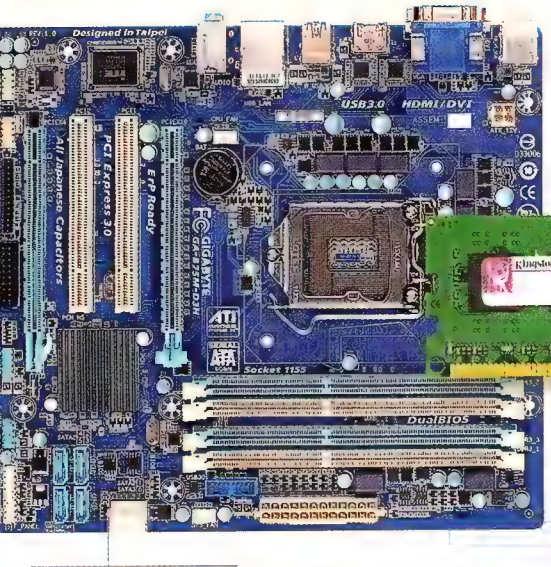
Right now, there is a real dearth of cards at around the $200 mark, which is ideally where our budget needs us to land. In terms of realistic options, it's either an AMD Radeon HD 7850 at around $250 or Nvidia GeForce GTX 560 for as low as $150. The GTX 660 Ti is too expensive at around $350 and the GT 640 at $100 isn't worth the effort. The upcoming GTX 650 will likely sit in that $200-250 area, but it wasn't yet released at the time of writing. Meanwhile, the HD 7850 will cost a little more, but it should last a couple of years.

MOTHERBOARD:

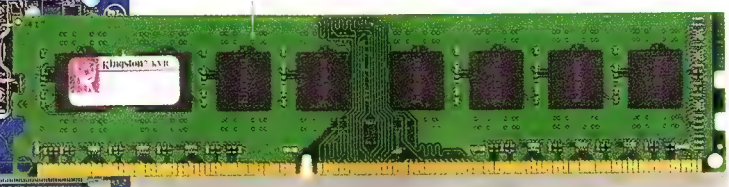
GIGABYTE GA-B75M-D3H ($79)

I reckon Intel's B75 Express chipset is a bit underrated and doesn't get the attention it deserves. It's basically an H77 Express without

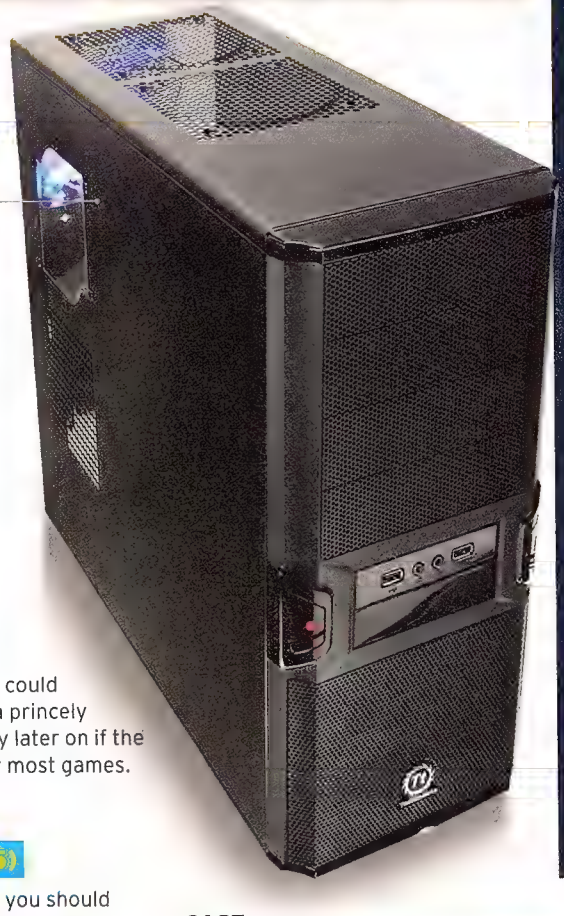
CPU: Intel's Core i5-3470.



Motherboard: Gigabyte GA-B75M-D3H.



RAM: Low-cost 4GB Kingston DDR3-1600.



Case: ThermalTake V3 Black Edition with 500W PSU.

the built-in Intel RAID. The fact that Gigabyte does this version for just $79 makes it great value, but you still get USB 3.0 and CrossFireX dual-card gaming support. It'll run our HD 7850 card at PCIe x16 speed, so you won't miss out there. The drawbacks are that only one of its six SATA ports is SATA 6Gbps and there's no overclocking; in our case, though, one SATA 6Gbps port is enough and we're not interested in overclocking anyway. The only thing would be to check that your HD 7850 doesn't block the SATA ports; however, the SATA 6Gbps port is horizontally mounted so it should be fine.

MEMORY:

4GB KINGSTON DDR3-1600 ($29)

Thank goodness for low RAM prices, that's all I can say! We could have chosen slower DDR3-1333 RAM, but we'd have saved a princely $4 so it wasn't worth it. You can always upgrade RAM easily later on if the budget allows; in the meantime, 4GB should be just fine for most games.

HARD DRIVE:

1TB SEAGATE BARRACUDA ST1000DM003 ($65)

With the budget we've got, there's no room for an SSD, but you should find this 7,200rpm Seagate drive a compromise between the cheap Green/Blue 5,900rpm models and considerably faster SSDs. The only SSD capacity we could realistically afford is 60GB, possibly 120GB if we compromised on something else. Sure, an SSD would load game levels considerably faster, but 60GB really isn't enough space to be practical.

Graphics card: The PowerColor AX7850-2GBD5-DH.

Hard drive: 1TB Seagate Barracuda ST1000DM003.

ARE CHEAP PSUs REALLY THAT BAD?

Horror stories on the web about dodgy PSUs killing gaming rigs are common, but while your mileage obviously may vary, I reckon most of those stories result from just pushing those PSUs too hard.

I wouldn't expect a budget 500W PSU to actually give me 500W, yet I *would* expect around 300W with reasonable comfort, which would certainly be enough for a Core i5-3470 CPU and Radeon HD 7850 graphics card in this instance. If you mentally de-rate a budget PSU's power output by a third to a half and don't push it beyond that, you won't go too far wrong. More of an issue is cheap 220/230VAC PSUs.

Australia's AC mains voltage is officially a nominal 230VAC (it was changed in 2000 from the 240VAC most of us grew up with), but we've measured our *APC* Labs voltage as high as 248VAC, which is starting to push the friendship on the +10/-6% voltage tolerance PSUs are supposed to handle here.

CASE:

THERMALTAKE V3 BLACK EDITION WITH 500W PSU ($80)

If you've been paying attention, you may have worked out part of my method of madness in choosing components. Part of the trick is knowing the components that are available, while another part is breaking down the budget area into percentages. I reckon we really can't afford to spend more than 10% of our budget on the case and PSU. Had this not been a gaming system, I'd have been sorely tempted to choose a cheaper case, but given that this system needs a decent box with a 500W PSU, it's an affordable option.

TOTAL COST: ABOUT $813

burners now sell for $
there aren't too many oth

WINDOWS 8 IN-DEPTH

THE FIGHT IS ON

Microsoft's Windows Store is the new spectacle-faced kid on the block. But can it match or overtake the success of the Apple and Google incumbents? Ashton Mills goes shopping.

If Apple has taught Microsoft one lesson, it's that selling your own software isn't enough – you need to sell *everybody else's* software, too. Long before Microsoft announced the Windows Store, we knew it was coming. Apple may have popularised and mobilised the app store concept to typical Apple efficiency, but it deals only in software for Apple devices. And while Google's equivalent caters nicely for Android, the market is there for someone to come along and fill the niche for Windows.

When you think about the sheer volume of apps sold on Apple's App Store, and the money tree showering down fountains of gold this happens to be, and that there are far, *far* more Windows devices in the world than Apple... you get the idea just how insanely profitable a Windows app store can become.

But it may not be as easy a money tree for Microsoft.

DEFINING THE WINDOWS STORE

Microsoft has spent as much thought on the Windows Store as it has on the design and integration of Windows 8 and its Metro UI. And in many ways, the slightly schizophrenic design epitomised by Metro and the desktop is reflected in the Store offering. too.

For one, it sells Metro apps and only Metro apps. This is fine for your tablet, but on the desktop it means that while you can buy and download Metro apps right from the store with a few clicks, if you want a 'desktop' app you're out of luck. And considering the desktop is currently *everything* that people currently use Windows for, this is ignoring the single largest component of the Windows ecosystem.

To mitigate this, Microsoft has made it possible to *list* desktop apps in the Windows Store, but you can't purchase or download them through there – the most it can provide is a link the manufacturer's web site.

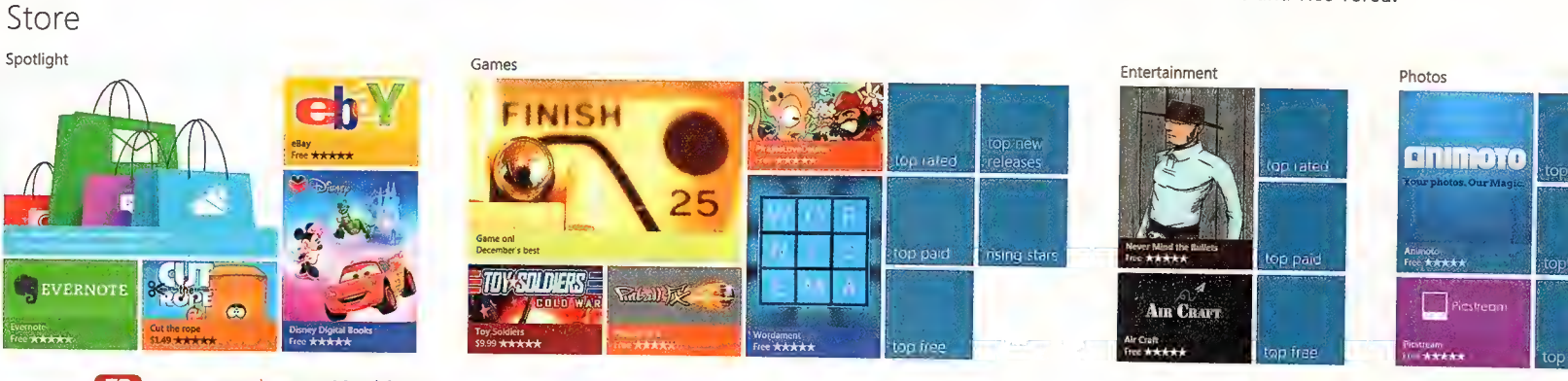
Desktop programs are still going to be the realm of boxed copies or digital download services. Be they one-off file hosting gigs or ecosystems like Valve's Steam for games.

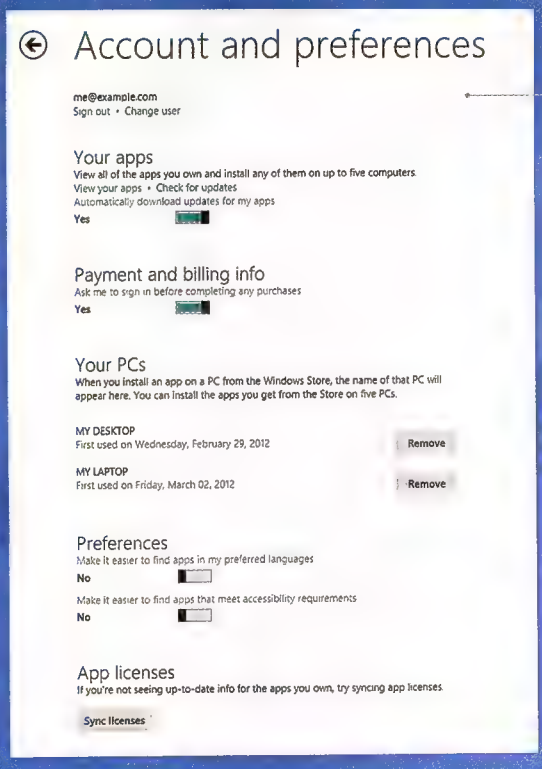
And here's where it gets even less consistent – installed Metro apps show up on the 'Start' screen, but not on the desktop. However, once they're installed, desktop programs create a Metro tile on the 'Start' screen to launch it (and in so doing, switch the view to Desktop mode!). This creates the scenario of programs appearing in an interface they have no relation to.

A good example of this is games: can you install games through the Windows Store? Indeed, but Metro-only games. If you buy a desktop game somewhere else and install it, it will appear on the 'Start' screen like a Metro game, even though it isn't, and it will take you to the desktop if you launch it. It doesn't help that in addition to tiles for Metro games and tiles for desktop games, there's an actual 'Games' tile in Metro, too, although this doesn't represent either category. Instead, it encompasses Xbox games (as the app clearly states). Except, it doesn't just let you buy games for the Xbox, it also lets you download and install Metro games. Confused yet?

If only we had some steak knives handy, because there's more – Windows Phone 7 has been out for a while now and sports the same familiar Metro look and feel. It also has a store, called Windows Marketplace. But it bears no relation to the Windows Store and apps from it can't be purchased, downloaded or transferred to Windows 8.

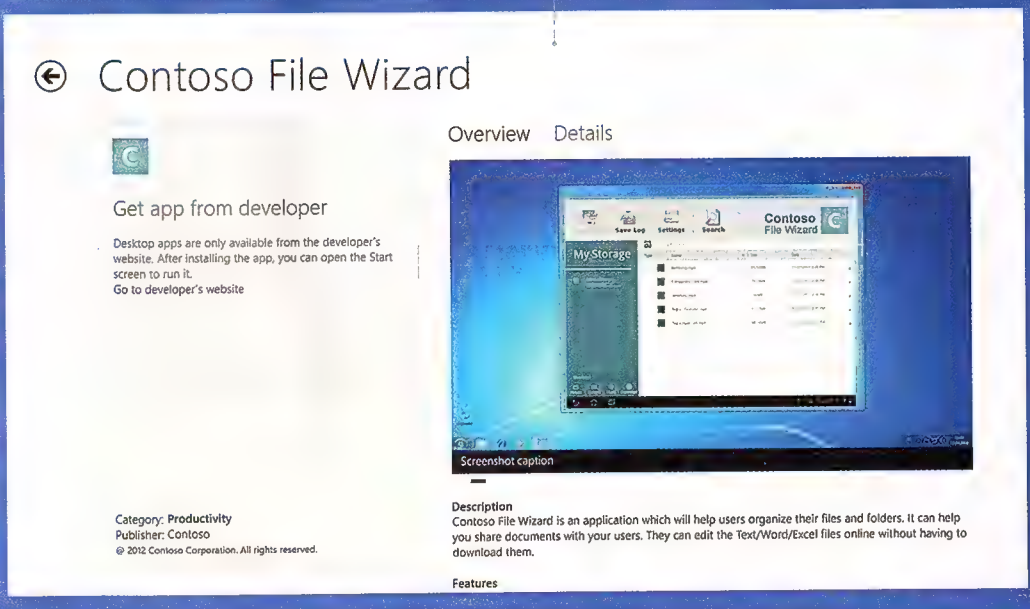
One of the advantages of Apple's ecosystem is that the same apps you have on your iPhone can run on your iPad, and the store for either is identical. The same is true for Google's Android and the Google Play store. But in Windows 8, the Windows Store will provide for Windows 8 tablets and PCs, but not for Windows Phone and vice versa.




Account and preferences
me@example.com
Sign out • Change user
Your apps
View all of the apps you own and install any of them on up to five computers
View your apps • Check for updates
Automatically download updates for my apps
Yes
Payment and billing info
Ask me to sign in before completing any purchases
Yes
Your PCs
When you install an app on a PC from the Windows Store, the name of that PC will appear here. You can install the apps you get from the Store on five PCs.
MY DESKTOP
First used on Wednesday, February 29, 2012
Remove
MY LAPTOP
First used on Friday, March 02, 2012
Remove
Preferences
Make it easier to find apps in my preferred languages
No
Make it easier to find apps that meet accessibility requirements
No
App licenses
If you're not seeing up-to-date info for the apps you own, try syncing app licenses
Sync licenses

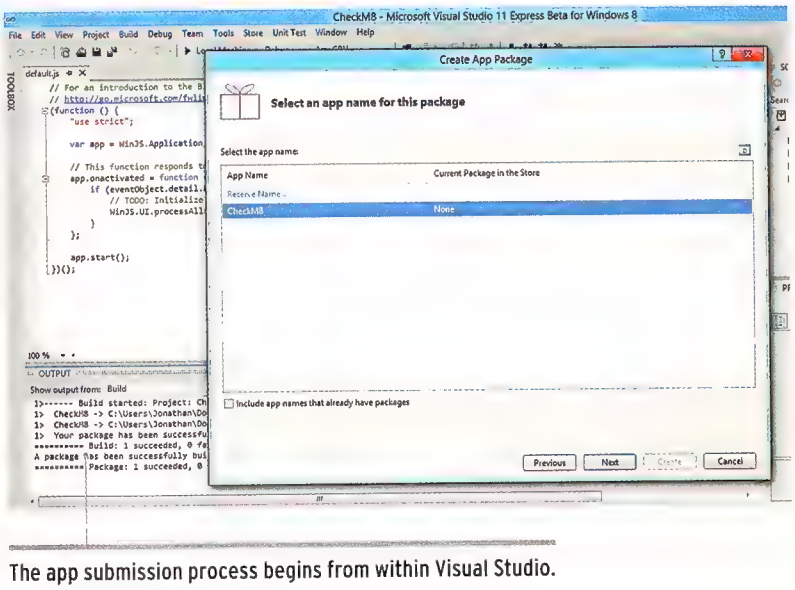
Apps can be installed on a maximum of five devices, configured through the Settings page

The Windows Store can also list non-Metro apps – but they can't be purchased or installed through it. They are basically just an advert for a web site.


Contoso File Wizard
Overview
Details
Get app from developer
Desktop apps are only available from the developer's website. After installing the app, you can open the Start screen to run it.
Go to developer's website
Contoso File Wizard
My Storage
Screenshot caption
Category: Productivity
Publisher: Contoso
© 2012 Contoso Corporation. All rights reserved.
Description
Contoso File Wizard is an application which will help users organize their files and folders. It can help you share documents with your users. They can edit the Text/Word/Excel files online without having to download them.
Features

THE INTERFACE FORMALLY KNOWN AS...

At the time of writing, Microsoft had officially announced 'Metro' is no longer the name of the new Windows 8 UI, in an attempt to avoid, legal issues by German retailer group Metro AG (clearly it's so easy to confuse retailing with a computer UI). There have been some rumoured replacements of 'Windows 8-style UI' and simply 'Windows 8' but with no official announcement, we've continued to refer to the new interface as Metro here.



The app submission process begins from within Visual Studio.

So, just what does the Windows Store mean for you as a user? If you're on a tablet, quite a seamless experience. On a desktop PC, a modicum of confusion between desktop and Metro interfaces, and desktop and Metro apps. And if you've got a Windows Phone, it doesn't offer anything for you.

RATING THE STORE

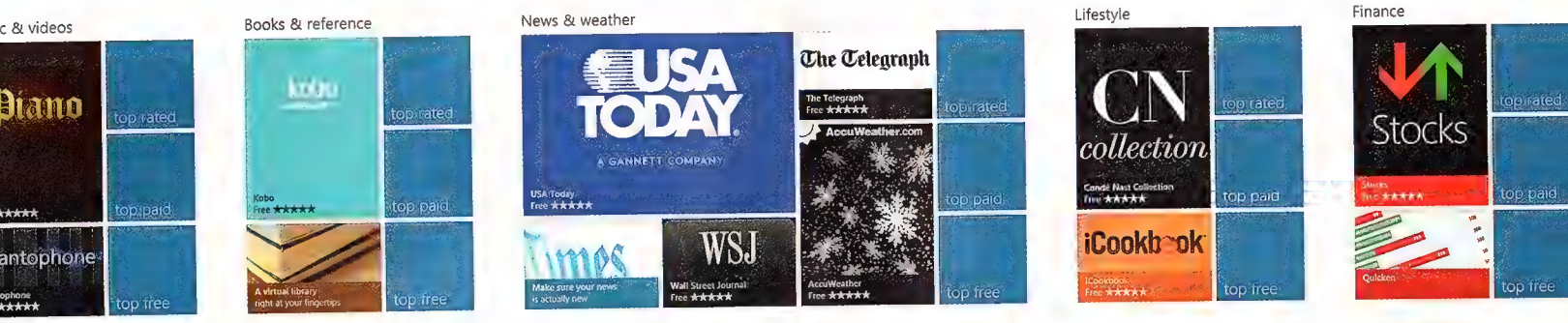
But is it all bad? Not at all – the store itself is well designed. For one, it mimics the Metro interface style, so if you get used to Metro you're automatically familiar with navigating the store.

On top of this, Microsoft has made it easy to search the store from anywhere within Metro, including a running app. If you bring up 'Search' from the 'Charm Bar', one of the categories you can click after typing in a search term is the 'Windows Store'. This is a neat feature, because if you happen to read about an app while in your browser, you can call it up in the store in seconds.

This is important, according to Microsoft's usability labs, as users are more likely to search for what they want than just browse the store. Still, a lot of work has gone into making sure the layout of the store reflects new content that changes regularly, clearly-defined categories for apps, navigable lists of apps for a wider view of a catalogue and editorially-driven featured content.

Updates for apps are also handled well: Windows 8 will automatically download, but not install, updates in the background while the machine is idle and is smart enough *not* to do this if you happen to be connected to a mobile network instead of Wi-Fi, so as not to waste your cap. The feature can be disabled from the store's preferences if you wish.

In the not-so-nifty camp, however, there's at least one limitation: while Metro apps can be installed on multiple Windows 8 machines,



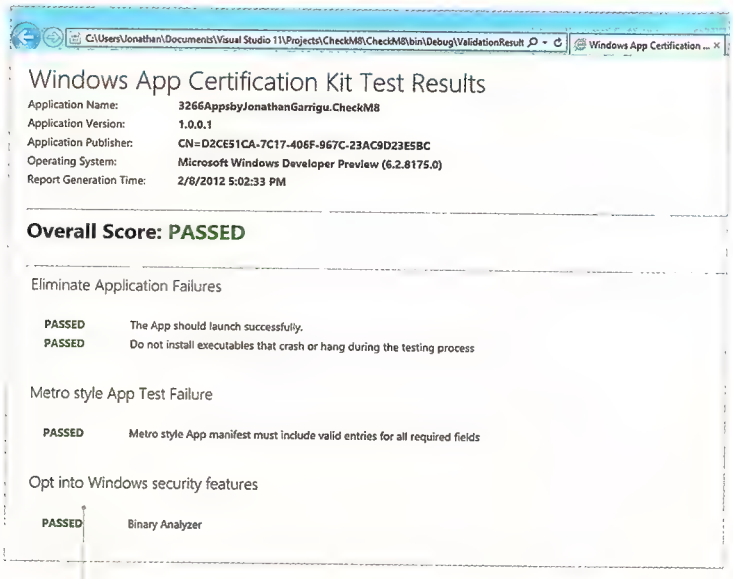
Microsoft Minesweeper
Overview
Details
Reviews
Free
Install
When you install an app, you agree to the Terms of Use and any additional terms.
This app has permission to use:
Your Internet connection
Description
Play the classic puzzle game that has been a part of Windows for more than 20 years, now re-imagined for Windows 8. Featuring adjustable difficulty, classic Minesweeper gameplay, and an upcoming brand new Adventure mode, Microsoft Minesweeper is better than ever.
Read more
Features
• Classic Minesweeper rules
• Adjustable difficulty setting
• Xbox LIVE enabled!
Read more
Learn more
Microsoft Minesweeper support
Additional terms
Microsoft Studios privacy policy
Report app to Microsoft
Report this app for violating the Store's Terms of Use
What version of Windows is complete without Minesweeper? Free apps can be downloaded without requiring a registered billing account
Books & reference
Games
Categories in the store can break down into lists for browsing the entire catalogue

you're limited to a maximum of five devices. This is in addition to the protection afforded by the fact that all these machines must be linked to your account regardless. At least Windows Phone devices don't count...

WHAT ABOUT DEVELOPERS?

We've had plenty of time to play with the Windows Store during the Consumer Preview and Release Preview builds, but what about if you want to build and sell your own apps through the store?

To try to make the process easy and therefore attractive, submitting an app can begin right from within Visual Studio. One nice feature here is that you can reserve your app name even before you submit a completed app. This isn't just a great way to ensure you can maintain a vision for your app (it would kind of suck having artwork and logos made only to find that by the time you submit someone else has taken your name), but for Microsoft it also encourages early participation in the app-submitting framework. This ultimately consists of a number of steps from validation and monetisation to internationalisation – all things a developer should be considering from the get-go.


Windows App Certification Kit Test Results
Application Name: 3266AppsbyJonathanGarrigu.CheckM8
Application Version: 1.0.0.1
Application Publisher: CN=D2CE51CA-7C17-406F-967C-23AC9D23E5BC
Operating System: Microsoft Windows Developer Preview (6.2.8175.0)
Report Generation Time: 2/8/2012 5:02:33 PM
Overall Score: PASSED
Eliminate Application Failures
PASSED The App should launch successfully.
PASSED Do not install executables that crash or hang during the testing process
Metro style App Test Failure
PASSED Metro style App manifest must include valid entries for all required fields
Opt into Windows security features
PASSED Binary Analyzer

Example output of the 'Technical' phase of the certification process.

Aiding this, developers can download the Windows App Certification Kit, which runs the same tests the store runs during certification, making it easier to ensure an app meets the certifications without wasting time in the process.

When submitting an app, there are a range of features developers can add, such as trials and in-app upgrades. Some good advice promoted by Microsoft is that the best possible advertising for the app is the app itself – and indeed, according to its own metrics, apps with trials sell five times more than apps without. You don't need to build a separate app for a trial, either: the store can effectively limit the app's usefulness based on a time period you set (one day, one week, one month or indefinitely).

The actual process of certification follows a number of steps: 'Pre-processing' (mostly checking of paperwork); 'Security tests' (virus and other malware); 'Technical compliance' (same tests as included in the Windows App Certification Kit); 'Content compliance' (manual labour-driven checking of content to meet content policies); 'Release' (basically ready, but you can delay publishing to a set a date, which keeps it at this state); and 'Signing and publishing' (the app is signed with a trusted certificate linked to your developer account).

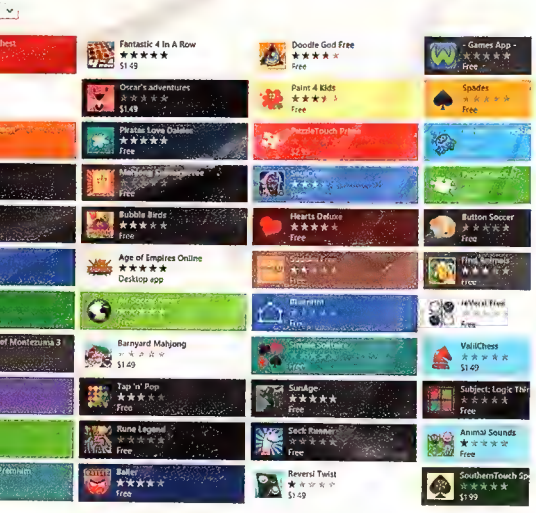
A developer can check the status of these steps at any time through a cleanly laid out status page, which can also provide detailed feedback for any steps that fail to meet the process.

Finally, Microsoft provides two ways you can enter the program as a developer: individual or company. The former is fairly straightforward, but requires you live in one of the developer markets Microsoft supports. The latter requires that just the business is registered in a supported market, although business applications are first verified by Microsoft including over the phone.

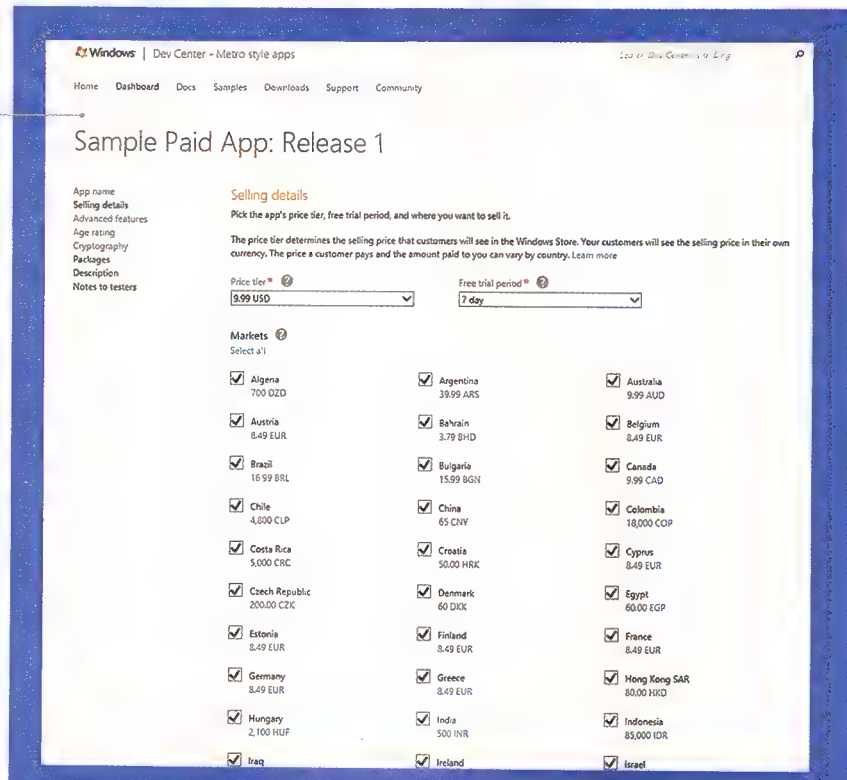
And with the release of Windows 8 to RTM, the Windows Store currently supports 38 languages for app submission with some 80 market-specific app catalogues.

SHOW ME THE MONEY!

The all-important question: how much do you make if you sell through the Windows Store?



You can set a price, whether there's a trial period and the wide range of markets the app can appear in.



Breaking ranks with the traditional model, Microsoft is proud to advertise that while initially all apps get 70% of the revenue with the remaining 30% going to Microsoft (just as with Apple's App Store), once sales of the app reach US$25,000 this increases to 80%.

Pricing differs from Apple and Google's models, too: the minimum price is US$1.49, up to a maximum US$999. This has caused some controversy, given the 99c mark is a widely known 'impulse buy' category and something for which Apple's App Store is popular. Of course, there's nothing stopping Microsoft changing this in the future, but for the moment this isn't an option.

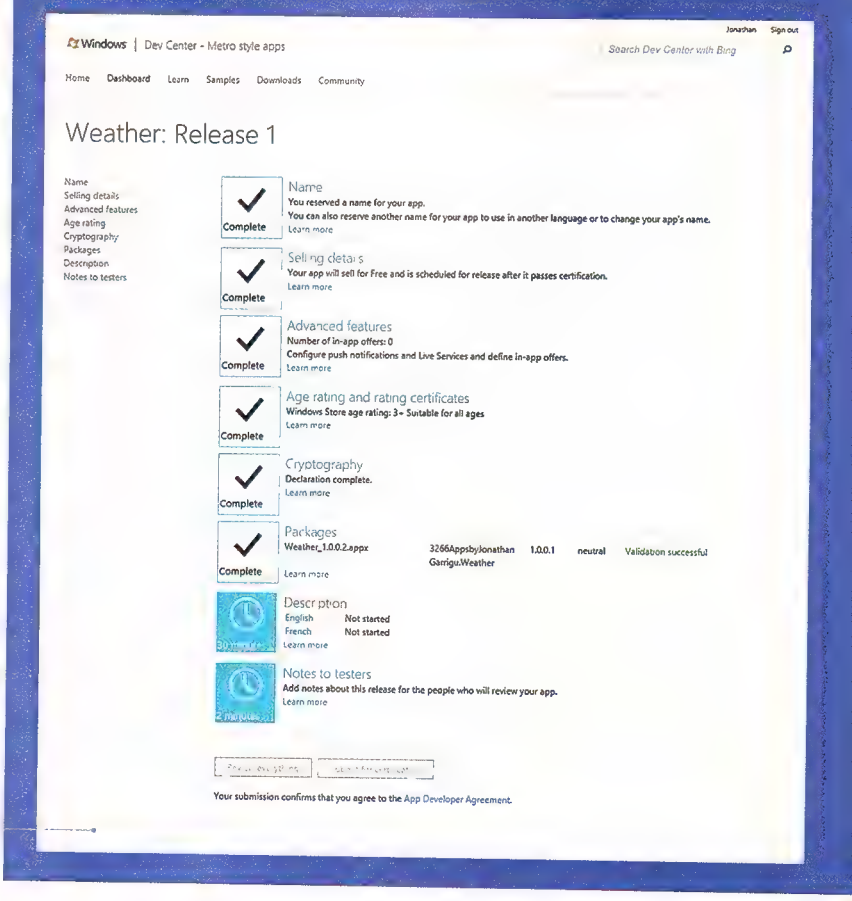
Not surprisingly, there are a range of other caveats, unfortunately also learning from forebears like Apple: revenue from your apps is paid monthly, and there's a static 30-day period from the date of publishing for new apps before any payment will be made. Furthermore, any payment period in which an app makes less than $200 won't be paid, instead rolling over until the sales exceed $200.

Finally, for Australian developers, it's up to you to manage tax reporting of this income just like any other. Note, however, that sales made in the US market may be subject to US taxes (see an accountant to clarify your obligations).

WHAT'S IN STORE?

Naturally, Microsoft wants to encourage app development as rapidly as possible to bring the store up to speed, so it's provided a compelling argument on its Channel 9 developer forum: by the end of 2012 alone, some 400 million PCs will have shipped. This is more than all the Apple devices (all of Mac, iPhone and iPad) and Android devices (phones and tablets) combined. In other words, if you want to make money selling apps, the Windows Store is where it's at.

However, as much as Microsoft might want otherwise, desktop adoption of Windows 8 is not akin to Metro adoption. And anecdotally from our experience, Metro on the desktop is something that's going to be tolerated more than embraced, so just how 'big' is the market for Metro apps really going to be? ADC



Numerous steps are involved in publishing an app. A handy dashboard helps you keep track of progress.

Experts solve your computing problems

APC and its readers can be one giant helpdesk. If you have a technical problem, chances are one of us can solve it.

MICROSOFT OFFICE

CONVERT WORD TEMPLATES

Q I've accidentally saved dozens of documents in the Word template format. Is there a quick way to convert these files into regular Word documents instead?
John Wear

A There's a built-in wizard included with Microsoft Word 2003 and earlier that will convert template files into regular documents for you. Whatever version you have, start by going to 'File > New'. Word 2003 users should then click 'On my computer' on the 'New Document' task pane.

Word 2002 users should select 'General templates' and Word 2000 users should click 'More Word templates'. Switch to the 'Other Documents' tab, choose 'Batch Conversion Wizard' from the list and click 'OK', then follow the wizard to convert your files quickly.

Sadly, there's no such wizard available for Word 2007 or 2010 users, but you can try a program called Convert Doc instead. You'll find a fully functional trial of the software at **tinyurl.com/435t3**.

First, make sure you select the option 'Use MS Word' under 'Conversion Method'. You'll then be able to select both DOT and DOTX template files. You can then select an output format – DOC, DOCX and RTF are all supported – and add files and folders for the program to convert automatically. Convert Doc also supports batch conversions.

WINDOWS

AERO STOPPED WORKING

Q I lost the Windows Aero interface two days ago and since then I've been unable to get it back. I'm running Windows 7 Ultimate and have tried both System Restore and the Windows Fix it Tool, which tells me that the Desktop Window Manager is turned off. Is there a way to resolve this issue? Thanks very much for your help.
Gary Waters

A We went to and fro with Gary for over a month trying to solve this annoying problem. Our first suggestion was to follow up the comment made by the Windows Fix it Tool and examine the Desktop Window Manager. We asked Gary to click 'Start', type services into the 'Start search' box and click 'services.exe' to open the 'Services' management console. Doing so revealed that the 'Desktop Window Manager' entry was turned on and set to start automatically.

We then asked Gary to update his GeForce graphics card drivers, but again this had no effect. Neither did restoring the 'System Rating' or attempting a number of registry tweaks suggested by other users. We even investigated Gary's computer to see if there was any evidence of malware infection (one suspicious file was found, but removed to no effect).

QUICK & EASY REPAIR TOOLS FOR YOUR PC

Q Is there some kind of all-encompassing tool that provides a host of fix-it options to solve problems with my PC?
Isobel Smith

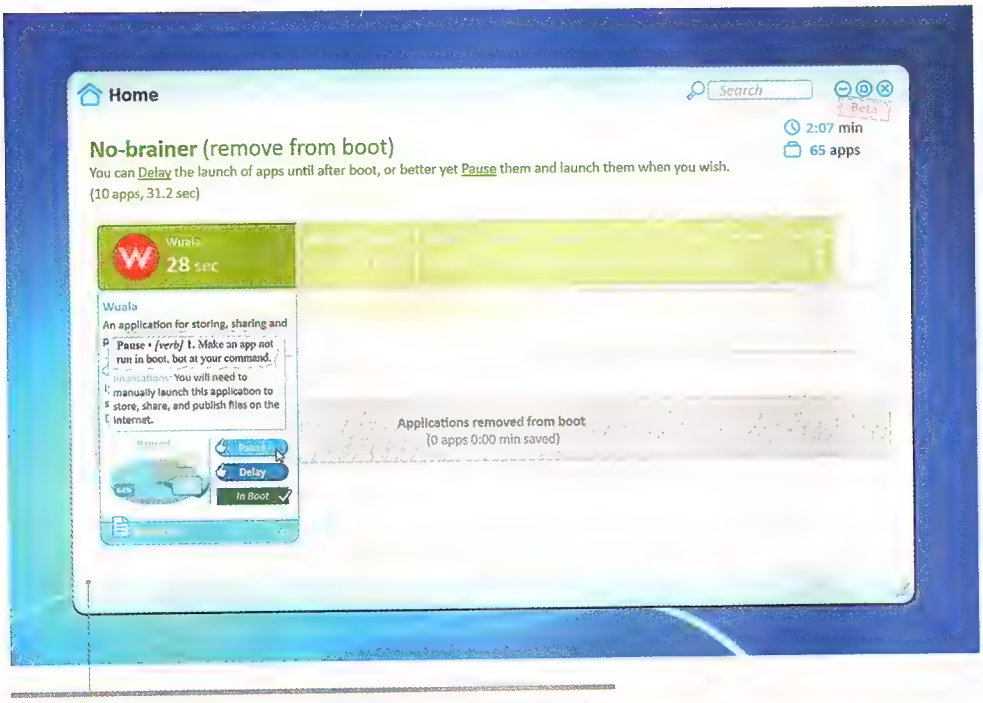
A FixWin 1.2 (**tinyurl.com/8zhv79f**) is a good tool to add to your system's armoury if you're running Windows Vista or 7. It's tiny (528KB), portable and provides a host of shortcuts to quick fixes for common problems. Here are four ways to quickly resolve issues with your PC.

01 SYSTEM FILE CHECKER

Many problems are due to missing or corrupted system files. The home page of FixWin provides a button that will run the tool in scan-and-fix mode, which will attempt to resolve any problems it finds automatically.

02 INTERFACE PROBLEMS

Select 'Windows Explorer' and you'll find a list of fixes covering various problems using the Windows interface. One particularly good tool may resolve issues with CD/DVD burning and folders displaying incorrect information.


Home
Search
Beta
No-brainer (remove from boot)
You can Delay the launch of apps until after boot, or better yet Pause them and launch them when you wish.
(10 apps, 31.2 sec)
2:07 min
65 apps
Wuala
28 sec
Wuala
An application for storing, sharing and
Pause • /verb/ 1. Make an app not run in boot, but at your command.
You will need to manually launch this application to store, share, and publish files on the internet.
Applications removed from boot
(0 apps 0:00 min saved)
Pause
Delay
In Boot

AERO PROBLEMS: Soluto manages the programs that launch when your PC starts, but has been known to cause issues with Windows 7.

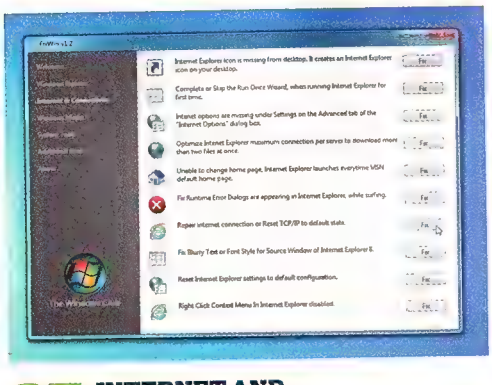
The next step was to try running the System File Checker (**tinyurl.com/3omrvl**), but this found no issues either.

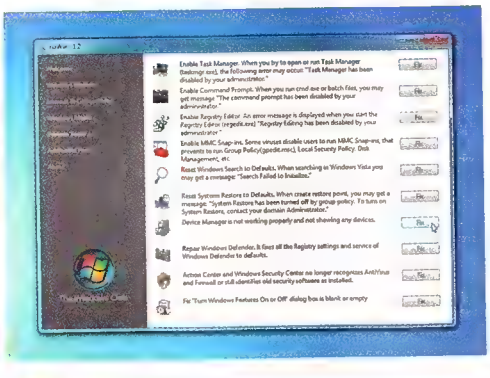
Then we found out some people had issues when using the third-party Soluto startup manager tool (**www.soluto.com**). Gary had this installed and after removing it, he was pleased to (finally) get Aero working again.

HARDWARE

SOUND ISSUES AFTER WINDOWS UPGRADE

Q I recently upgraded my Fujitsu Siemens Esprimo Mobile laptop to Windows 7 Home Premium 32-bit and the only problem I've encountered is crackly sound,





03 INTERNET AND MEDIA ISSUES

The Internet and Connectivity section has some great tools – try 'Repair internet connection' if you have connectivity issues. 'Windows Media Center' includes tools to reset databases, which can fix many problems.

04 SYSTEM REPAIRS

The 'System Tools' section contains a number of fixes, including ones that can help restore your PC after a malware infection. Additional fixes include miscellaneous tools, with three that can fix Aero-related problems.

QUICK QUESTIONS

Can you recommend a program that lets me resize open windows to a specific size for screen grabbing purposes please?
Ben Kinghorn

*Try AutoSizer 1.71 (**www.southbaypc.com/AutoSizer**). Once installed, open it from the taskbar notification area, select your window of choice and choose 'Edit'. Tick 'Set size', enter your dimensions and click 'OK' when you're done.*

How do I resolve the following error: "ASCTray-System Error, program can't start because RT120.BPL is missing"?
Henry Willett

This is linked to a program called Advanced SystemCare from IObit. Uninstalling and then reinstalling the program should resolve the problem.

Is there an option to selectively accept read receipts to individual emails in Windows Live Mail? I can only find a global on/off setting.
Brian Perriss

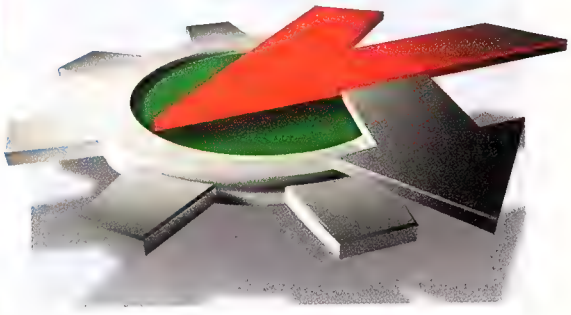
Yes. When composing an email, look closely at the 'Delivery' section on the Ribbon, where you'll find a box next to 'Read receipt'. Tick this to add a read receipt request to the email before sending it.

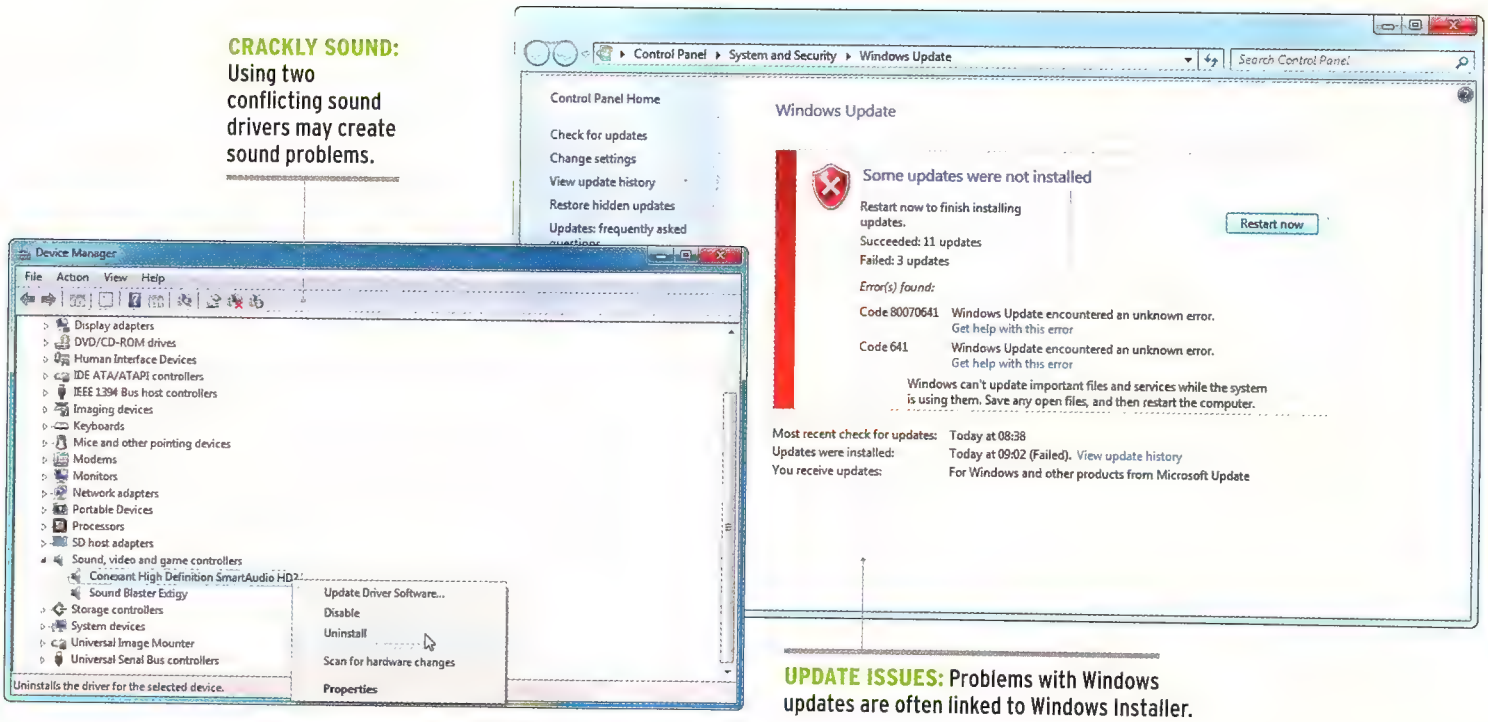
I want to use DrivePurge to clean up my PC. I've been told I should download the 32-bit version of the program. Is this also true for 64-bit users?
Doug Millard

If you're a 64-bit Windows user, we recommend downloading the 64-bit version of DrivePurge – or indeed any program that offers a 64-bit option – to ensure better performance and stability on your system.

I have Kaspersky Internet Security. Do I really need Windows Defender, with its stream of updates? Can I uninstall it and if so, how?
Julie de Burgh

You don't need Windows Defender with Kaspersky, but you can only disable it. Open it, go to 'Tools > Options', scroll to the bottom of the list and untick 'Use Windows Defender' under 'Administrator Options'. Finally, click 'Save' followed by 'Continue'.




Control Panel ▸ System and Security ▸ Windows Update
Search Control Panel
Control Panel Home
Check for updates
Change settings
View update history
Restore hidden updates
Updates: frequently asked
Windows Update
Some updates were not installed
Restart now to finish installing updates.
Succeeded: 11 updates
Failed: 3 updates
Restart now
Error(s) found:
Code 80070641 Windows Update encountered an unknown error.
Get help with this error
Code 641 Windows Update encountered an unknown error.
Get help with this error
Windows can't update important files and services while the system is using them. Save any open files, and then restart the computer.
Most recent check for updates: Today at 08:38
Updates were installed: Today at 09:02 (Failed). View update history
You receive updates: For Windows and other products from Microsoft Update
Device Manager
File Action View Help
Display adapters
DVD/CD-ROM drives
Human Interface Devices
IDE ATA/ATAPI controllers
IEEE 1394 Bus host controllers
Imaging devices
Keyboards
Mice and other pointing devices
Modems
Monitors
Network adapters
Portable Devices
Processors
SD host adapters
Sound, video and game controllers
Conexant High Definition SmartAudio HD
Sound Blaster Extigy
Storage controllers
System devices
Universal Image Mounter
Universal Serial Bus controllers
Update Driver Software...
Disable
Uninstall
Scan for hardware changes
Properties
Uninstalls the driver for the selected device.

CRACKLY SOUND: Using two conflicting sound drivers may create sound problems.

UPDATE ISSUES: Problems with Windows updates are often linked to Windows Installer.

a bit like an old vinyl record. I've tried the latest driver from the Fujitsu Siemens web site, plus the latest updated Microsoft driver and the free Driver Easy program, all to no avail. Can you help? It worked fine before the upgrade.
Johnny Tinkler

A We've heard of this problem before and sometimes it's linked to two sound drivers having been installed alongside each other after a Windows 7 upgrade. However, a quick trip into 'Device Manager' on Johnny's part (click 'Start', type **device** into the 'Start search' box and click 'Device Manager') revealed just one sound driver under 'Sound, Video and Game Controllers'.

We'd also heard of this problem being linked to some older Realtek HD sound chips and sure enough, Johnny confirmed that his laptop was running such a chip. The solution in this case was to install an older Windows Vista version of the driver and we found such a driver on the Softpedia web site (access it from **tinyurl.com/9x2crup**). Downloading and installing this immediately resolved Johnny's problem.

SECURITY

USB DRIVE FILLS WITH GIBBERISH

Q I purchased a new 4GB Kodak USB drive today and as soon as I plugged it into my PC, it started writing files such as 'cbfmfs' and 'cbfmf' to a randomly numbered folder. I noticed a similar folder on my old 2GB drive that corrupted at the weekend. It's over 2.7GB and I'm worried it might be the result of a virus.
Ben Page

A Ben was spot on with his assessment of it being a virus infection, a diagnosis that was confirmed when he revealed that deleting the folder or formatting the drive had no effect – it immediately filled up again.

During our investigations it also transpired that Ben was relying on Windows Defender and the occasional scan using McAfee Security Scan Plus to protect his system from malware – there was no full antivirus software or firewall installed on his PC.

We instructed Ben to install a free antivirus tool like Microsoft Security Essentials or Avast! (**www.avast.com**), and download and install Malwarebytes Anti-Malware. Luckily the infection didn't block either program and the tools confirmed – and removed – various infections from his PC.

Once that was done, the USB drive started behaving properly once again.

WINDOWS

WINDOWS INSTALLER WON'T WORK

Q A few weeks ago, an error message appeared on my PC that was connected to Windows Installer, claiming the program was missing from my 'Services' menu. I'm not sure if Windows Installer was missing before the error. I'm running Windows Vista Home Premium SP2 and since getting the error message, I've been unable to install any programs or updates. Your help would be much appreciated.
Charlie Wilson

A Our first port of call was the Microsoft Fix it Centre and in particular, a tool designed to resolve problems with installing and uninstalling programs (**tinyurl.com/6rzwvoa**), which we instructed Charlie to download and run.

Unfortunately, this program found no problems to fix so we soldiered on, looking for other options.

We then came across a Microsoft KB article at **tinyurl.com/77fereg** that referenced Charlie's problem exactly, and even provided a fix-it tool that was designed to perform the complicated registry changes required to resolve the problems the article describes. For the second time, however, the tool failed and we were thwarted.

We were left with two things to try prior to biting the bullet and suggesting a reinstall. The first option was to try the System File Checker. This came up trumps – it reported problems with files, but despite saying it couldn't fix them all, it corrected enough to get the Windows Installer working, allowing Charlie to install apps and updates once again.

CONTACT@APCTEST.COM Share your tech tips

Have you solved a tech problem or found a better way of doing things with your computer? Share your information with other APC readers by sending it in as a tip to contact@apctest.com, together with your name and contact details (details won't be printed). Alternatively, if you have a technical question post it online on our forums at apcmag.com/forums and other readers may be able to solve it.

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First look at Quantal Quet... wait, what?

You can expect a surprising number of changes in the latest Ubuntu release. Ashton Mills explains.

APC EXPERT

ASHTON MILLS

Ashton has been testing OSs since Slackware came on floppies. Before that he was one of the few who used OS/2 (and loved it) and before that, he remembers installing Windows 3.1 NT from 22 floppy disks. His idea of fun is to spend a weekend compiling the latest Linux kernel or testing out the latest Windows beta.

OK, so it's tradition that Ubuntu release code names are an alliterative art, but perhaps we're getting to the somewhat ridiculous stage. Admittedly, though, the letter Q does limit one's options. Regardless, here's hoping Quantal Quetzal, aka Ubuntu 12.10 and the point release of the 12.X milestone, turns out to be as polished as its namesake is hard to pronounce. After all, 12.04 promised us many things and so all eyes (including those beady Quetzal ones) are on 12.10 to see what it can deliver. So let's take a look, shall we?

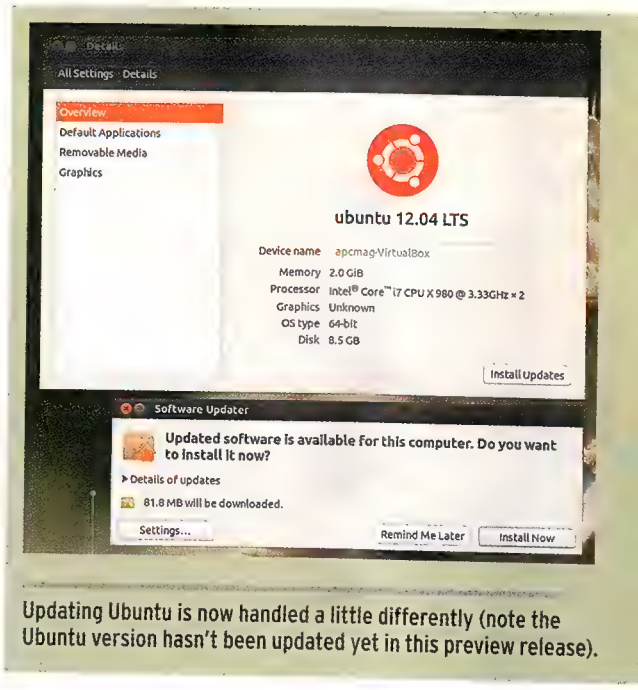
BUILDING UPON UNITY

Canonical is firmly committed to the Unity interface now, which we have to admit, has grown on us. While distributions like Linux Mint have completely dropped the GNOME 3.0 fiasco to go with its own interpretation of the GNOME interface, likewise Canonical's Unity is a departure from GNOME, yet still relies on core components.

In Quetzal the goal is to move to GNOME 3.6 by release, although most of the packages are currently GNOME 3.5-based (development branch). This covers a range of improvements such as a new lock screen, redesigned control panels and new input methods. On top of this, Canonical has updated the default 'Ambience' and 'Radiance' themes with some subtle yet pleasing eye candy changes: rounder corners on widgets, coloured checkboxes, softer gradients when they're used, and even the sliding status bar (seen with file operations, for example) looks schmick.

Also new is a major reorganising of the 'gears' system menu – out are the 'Displays' and 'Update Manager' links, in is a new 'Ubuntu Help' and 'About this Computer'. The 'User' menu is also integrated now, making for one less icon set in the toolbar.

The Nautilus file manager is undergoing a significant change for Ubuntu 12.10.



Updating Ubuntu is now handled a little differently (note the Ubuntu version hasn't been updated yet in this preview release).

NAUTILUS NO MORE

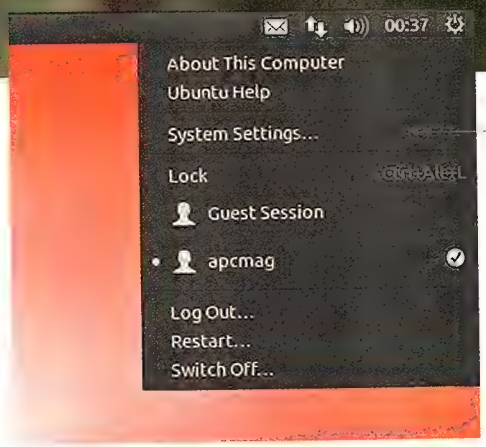
Nautilus, GNOME's default file manager, has received a lot of flak over the years. It works, yes, but it lacks many features file managers from other operating systems have by default. Such is the derision for Nautilus that there are numerous patches and forks of it, and Canonical can no longer ignore them. The result is that, in 12.10, Nautilus is being reshaped. It's currently a moving target, but some of the changes include a redesigned left pane for displaying locations and devices (replete with new icons), a new navigable location bar, integrated search and a 'gears' icon to display features previously located in menus, such as launching a new tab or connecting to a server. We'll have to wait for the final Quetzal release before seeing if the changes are a welcome improvement.

UPDATE MANAGER NO MORE

What? Is the Update Manager gone? Not really, but it's undergone something of a metamorphosis – it can no longer be found in the 'Gears' menu, but instead appears in the new 'About this computer' dialog, which actually means it takes more clicks to check for and install updates, a change we don't like. Indeed, this is the only way to access it now, as it's been removed from the 'System Settings' panel as well.

Additionally, the Update Manager has been renamed to 'Software Updater' and sports a new dialogue after it checks for updates that lets you configure update settings, install the latest updates or 'Remind me for later'. The latter is a nice feature to have if you're on the move with a laptop and don't have the bandwidth to update at that time.

Quetzal comes with a host of new beautiful backgrounds.



A new system menu combines the previous user and system menus into one.

MIGRATION ASSISTANT NO MORE

The installer waves goodbye to the Migration Assistant, previously used to import personal settings and data from a Windows installation on the same machine, for example. Sounds like a good feature?

Maybe, but according to Canonical the assistant was a "continuing source of bug reports" and that "the installer team felt that it was not worth the resources to bring it up to a level of quality sufficient to continue including it". Fair enough!

UNITY 2D... YOU GET THE IDEA

Yep, something else is going from Quetzal, too – the 2D-accelerated version of Unity, used as a fallback for machines lacking enough 3D grunt. So what about said grunt-lacking machines that want to run Ubuntu? While Unity 2D is going, helping Canonical to standardise on one Unity experience, machines incapable of running Unity 3D via hardware-accelerated graphics will instead utilise a new software based renderer called LLVMpipe, from the Gallium project.

This translates OpenGL to machine code in real time, and even supports multithreading up to eight CPUs – in other words, it's actually very fast software rendering and means all machines can run Unity 3D, whether they have hardware-assisted accelerated graphics or not.

THE USUAL SUSPECTS

Core programs such as Firefox, LibreOffice and gcc toolchain are all updated, as are utilities such as e2fsprogs (with fixes to support for file systems larger than 16TB) and RAID manager mdadm (with improved Intel Matrix RAID support). The OS is making a move from Python 2.0 to Python 3.0 as well, with many Python components either already ported to 3.0 or in the process of being ported. By release Python will be the default, though 2.0 can still be optionally installed. Lastly, we can expect the near-latest kernel at the time of release, of course, which means it will be Linux 3.5-based by the time of release.

CONSOLIDATING THE IMAGE

Previously, both a CD and DVD version of Ubuntu were available – technically, the DVD version just included more packages you could download separately than with the CD version. So it's no surprise that starting from 12.10, there'll now be only one image – around 800MB at the time of writing. This means you can no longer burn the Ubuntu install image to a CD, but who uses CDs now anyway? It's much simpler, faster and cheaper to use a USB key for the target image when installing a new version of Ubuntu. And don't forget, Ubuntu comes with its own tool to help you make this image (called Startup Disk Creator).

The final release of Quantal Quetzal is due October 18.

Recording games for fun & profit sharing

Show off and share your gaming prowess — here's how.

APC EXPERT

ASHTON MILLS

Ashton has been testing OSs since Slackware came on floppies. Before that he was one of the few who used OS/2 (and loved it) and he remembers installing Windows 3.1 NT from 22 floppy disks. His idea of fun is to spend a weekend compiling the latest Linux kernel or testing out the latest Windows beta.

Gaming has become an integral part of our culture – from consoles like the Xbox and hardcore PC users, to casual gaming on smartphones and on Facebook. Most everyone's playing something, somewhere. And for those of us for which it's more than a casual fad, a passion and a hobby instead, there are plenty of times when you probably want to share your gaming exploits with friends or the gaming communities you participate in.

While there are dedicated hardware solutions that you can use to record your output video, and this is the only way to record games on consoles like the Xbox, these are expensive. If you're on a PC, these aren't really necessary because all you need are a few simple software tools.

RECORDING YOUR SESSION

Two of the more popular programs to record a game as you play are Fraps (**www.fraps.com**) and Bandicam (**www.bandicam.com**). These programs cleverly hook into the display chain of DirectX and grab everything you see and hear. Fraps has a loyal following, but Bandicam has started to displace it for some gamers, as it offers slightly more control over the video that's recorded.

Both tools are easy to use and recording a game is as simple as loading Fraps or Bandicam first, launching your game and hitting the predefined 'Record' key to save everything you to do to disk as a video.

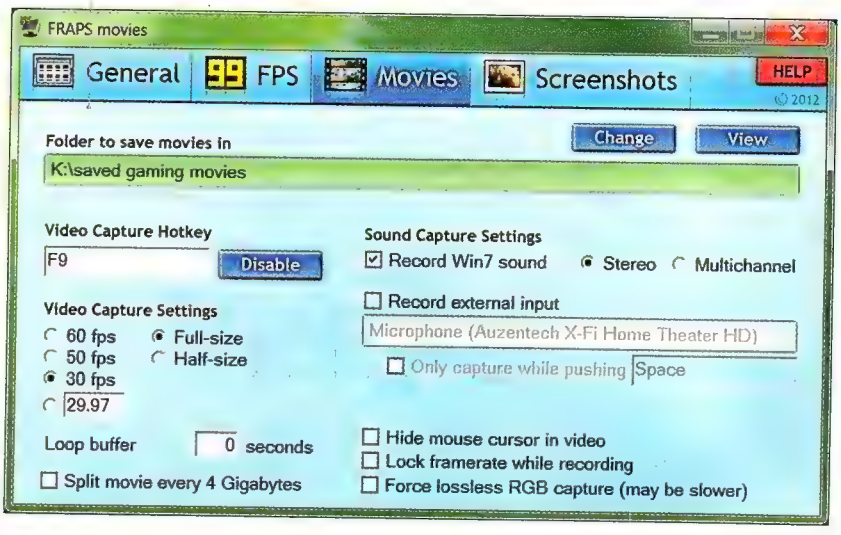
However, there are some caveats. Recording high-resolution video can be demanding on your system's I/O, so much so that after a few minutes stuttering may occur (both in-game and in your recorded video) as your system tries to keep up. By way of example, just 30 seconds of 1080p gameplay at 60fps in Fraps takes up a juicy 2GB of space, making a 10-minute video 40GB. There are a number of ways to mitigate this, though:

- **Lower the resolution**. Either play at a lower resolution, or record at a lower resolution. Both Fraps and Bandicam have a 'half-res' option that internally records at half the resolution you're playing at.
- **Lower the frames per second**. Less frames saved is less data per second. While 60fps looks fantastic, it can suck up disk space fast. 30fps is an accepted standard for videos online, including YouTube.
- **Use a disk cache**. If you have spare RAM, even just 1GB, using disk cache software like FancyCache (**www.romexsoftware.com**) can smooth out all the kinks. Set the cache to be write-only and to release the contents after write, and you'll be able to record smoothly for hours (disk space permitting!).

Finally, one advantage Bandicam has over Fraps is the ability to compress with MPEG-1 while it's recording. This is a fast, low-overhead method for the CPU to ensure compressing doesn't impact the game, but enough to reduce bandwidth when recording – about eight times smaller, depending how you configure it.

Despite recommending the use of a lower resolution or fps, experiment with what your system can handle and record in as high quality as you can without it impacting your system. While you may not necessarily upload and share the full-quality version, having it as a source gives you more options when it comes to transcoding it for sites to upload (you can always transcode a video from 60fps to 30fps, for example, but not the other way around if you want to maintain quality).

Both Fraps and Bandicam come with free versions, which put a watermark on your video. It's removable if you purchase the full product.



Fraps is a popular choice for recording games, but it's not the only one.

TRANSCODING YOUR VIDEO

Whichever tool you use, your recorded video is likely going to be too large if you intend to share it. As both Fraps and Bandicam save video in a lossless or lightly compressed format to maximise quality and minimise impact on the CPU, the resulting files can be rather large. So before you share your gaming extravaganza, you'll need to recompress the video into a more palatable size: YouTube has a maximum file size of 20GB, for example.

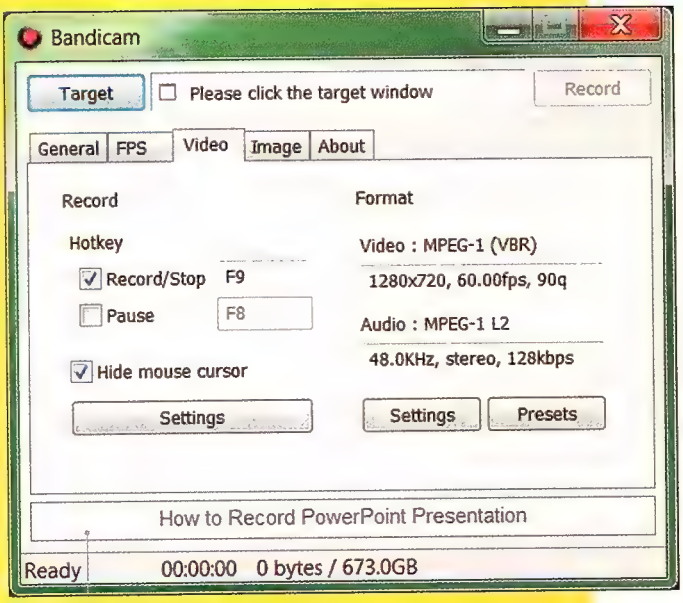
If you haven't played around with video transcoding much, two easy-to-use tools are HandBrake (**handbrake.fr**) and Freemake Video Converter (**www.freemake.com**), the latter of which even includes a YouTube profile to make uploading to YouTube a little easier.

The format to encode to depends on where you're uploading. YouTube handles a variety of formats including

WHAT ABOUT SSDs?

Using an SSD as the recording target will certainly alleviate any I/O bottlenecks when recording. However, given that most SSDs are considerably smaller than mechanical drives, volume is likely to be a concern, not to mention shortening the lifespan of the drive if you plan to regularly record and transcode videos on the device. For this reason it's usually better to use a traditional drive and follow the advice on these pages to reduce any I/O impact.

Freemake comes with a lot of profiles for popular encoding targets such as smartphones and YouTube.



Bandicam provides lots of options for the quality of the output video, including compressing to MPEG-1.

AVI, MKV, WMV, MP4 and WebM. AVI is a good choice as it's widely supported, and makes it easy if you're sharing a file directly with friends through a hosting service and don't know what they'll be using to play it. For the codec, H.264 is pretty much standard now – it's excellent at the perennial space/size trade-off of compression, providing great quality and small file sizes.

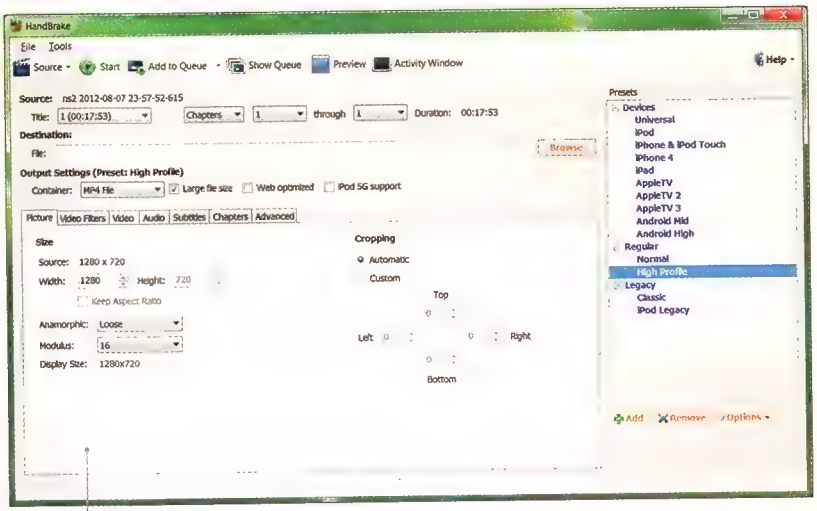
And this is why it's good to capture your video in as high a resolution and frame rate as you can. Depending where you're uploading to, you can re-encode your video to lower resolutions and smaller frame rates as you go, using different settings for different sites if need be – or provide 'high-res' and 'low-res' downloads for those who may be bandwidth starved.

Using tools like HandBrake and Freemake Video Converter is relatively straightforward, and both will allow you to shrink resolution and reduce fps when you encode.

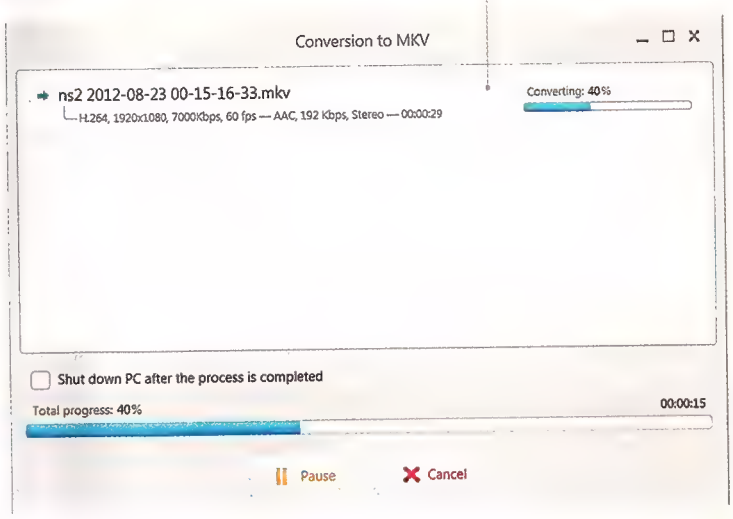
However, you'd be surprised at just how efficient H.264 can be, so first simply create a straight H.264 encoding of your video without changing any other parameters – all things being equal, just recompressing into H.264 can dramatically reduce the size of your video enough to make it an easy upload. To do this:

- **HandBrake**. After loading your source file, click on the 'High' profile under the 'Presets' on the right. Click the 'Picture' tab and set 'Anamorphic' to 'Strict'. Then, under the 'Video' tab, set the 'Framerate' to 'Same as source' and make sure 'Constant Framerate' is ticked. The default 'Quality' setting should provide a good trade-off for size. For our example 1080p 60fps 2G Fraps video, HandBrake shrinks this to 100MB.
- **Freemake**. After adding the source video, click on the 'MKV' profile and under 'Preset', choose 'Same as source'. Click the gear icon and set your frame rate (there's a bug in the current version where 'Original' actually sets the frame rate to 25), then click 'OK'. Finally, Freemake determines quality based on size: under the 'Save to' filename, you'll see a weight icon; click on this and choose a size. Experiment with different sizes to see what quality you get, as it's dependent on your resolution, frame rate and the source material.

If you then need to reduce the file size further, first lower the frame rate to 30 (if not already) and then reduce the resolution. You can alternatively decrease the visual quality by upping the compression ratio, but a high-resolution video at high compression can look ugly with blocky artefacts and loss of detail. It's generally better to keep the quality level the same and sacrifice resolution to get a good result; for example, reducing 1080p video to 720p.



HandBrake is a well-known transcoding tool for Windows, Mac and Linux.



Converting a video to H.264 while maintaining the resolution and fps.

Using your iPhone with Mountain Lion

The latest update to Mac OS X makes sharing information between your iPhone and Mac easier than ever.

APC EXPERT

JENNETH ORANTIA

Jenneth Orantia has been writing and obsessing about mobile technology for nearly a decade. Her first iDevice was a Compaq iPAQ, and she counts jailbreaking and installing custom ROMs as two of her favourite hobbies.

Remember the early days of iOS, when the only way to pass information between your iPhone and Mac was through iTunes? Thankfully, Apple has seen the error of its ways, and you can skip iTunes altogether in favour of syncing through your iCloud account. The newest version of Mac OS X, Mountain Lion, has integrated iCloud at a system level, which makes sharing multimedia, files and personal data between an iOS and Mac device far more seamless than it's been in the past.

If you haven't done so already, the first thing you'll need to do is set up iCloud on your Mac. Go to 'System Preferences > iCloud' (under 'Internet & Wireless') and enter your Apple ID and password. Here, you can set up all the items you want to sync with your Mac. If you're using iCloud on your iPhone, these are the same items you're probably syncing already, and changes you make to any of those information types will be synced across all your Apple devices automatically.

But before we jump into the new iOS-friendly features in Mountain Lion, let's do a quick recap of some of the old iCloud features that debuted with iOS 5. iTunes in the Cloud lets you push any new music purchases to all of your Apple devices automatically, saving you from having to manually transfer them through iTunes on your desktop. The same is also possible for books and apps. To set up these automatic downloads on your iPhone, go to 'Settings > iTunes & App Stores', and switch the 'Automatic Downloads' for 'Music', 'Apps' and 'iBooks' (this only appears if iBooks is installed on your device) to 'On'. iCloud also keeps your calendar, contacts and mail in sync between your Apple devices.

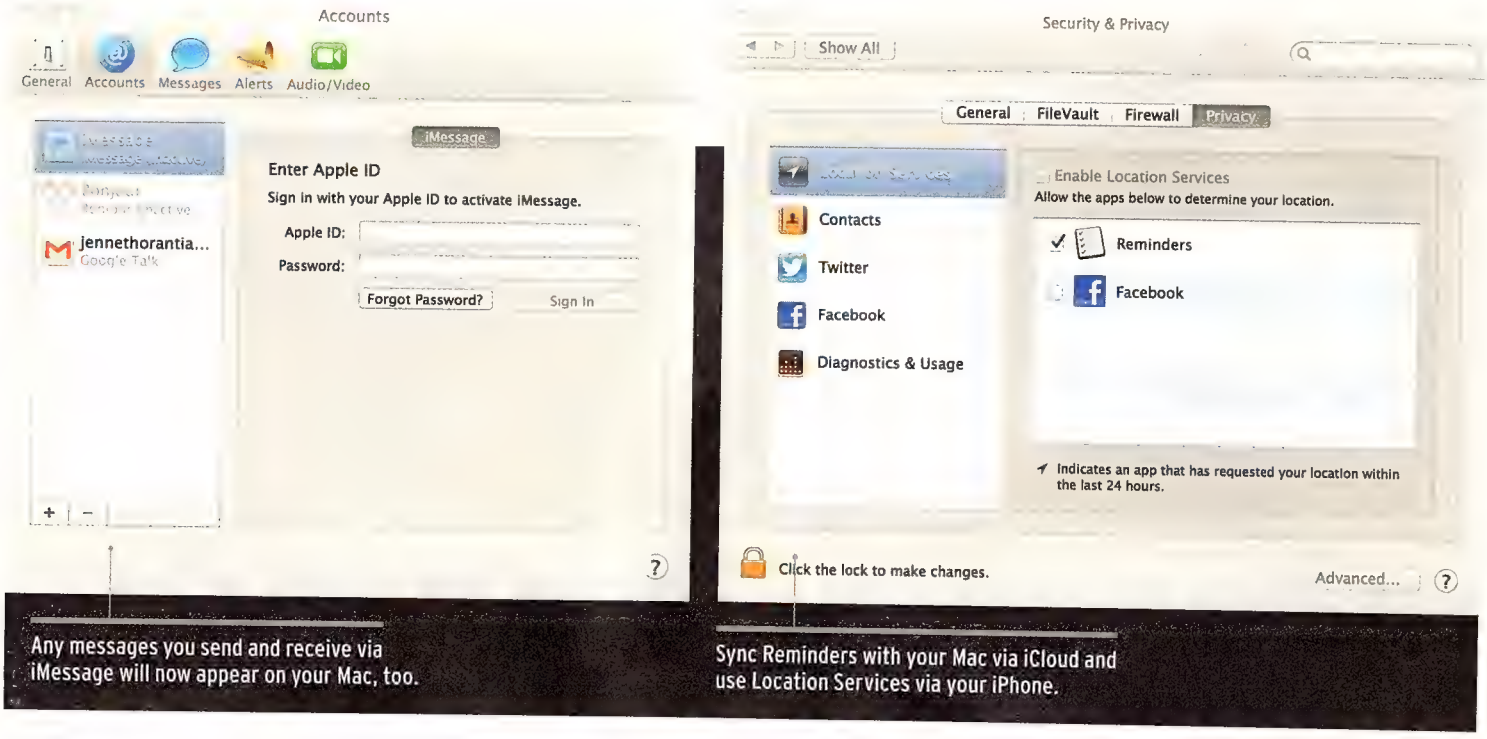
MOUNTAIN LION FEATURES

Got lots of friends with iPhones and iPads? You're probably well-acquainted with the free iMessage service, and now you can use iMessage from a Mac as well. This service isn't enabled by default – to set it up, open the Messages app, click 'Preferences > Accounts > iMessage', then enter your Apple ID and password. Any messages that you send or receive from your iMessage account from now on will appear in the Messages app on your Mac, even if you sent them from your iPhone originally, letting you keep up with your iMessage conversations seamlessly between devices.

iMessage also lets you attach photos, videos, documents and contacts to a message. For larger files in particular (iMessage supports file attachments up to 100MB), you may want to switch to your desktop to send them so you don't waste your mobile data allowance.

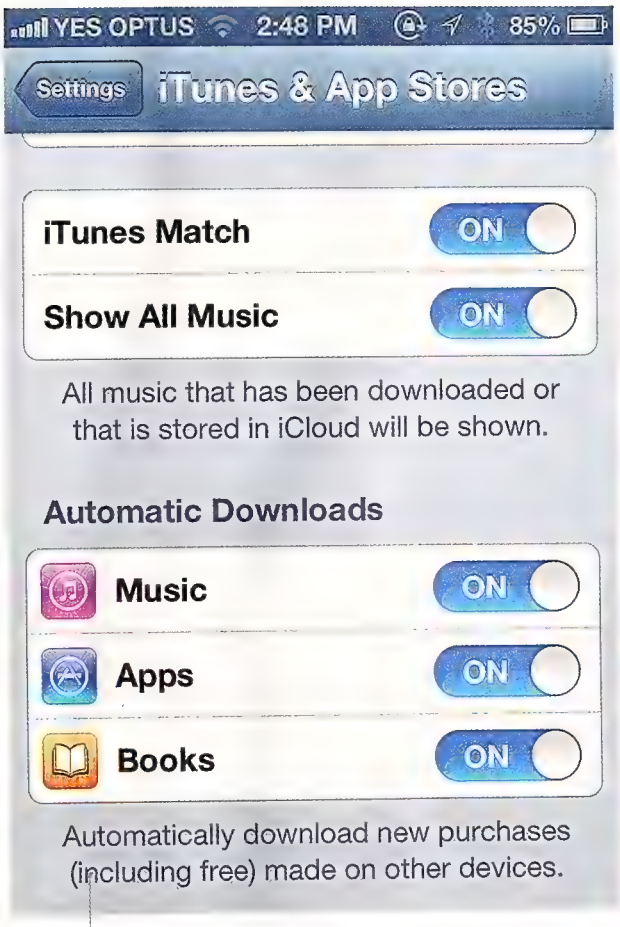
Mountain Lion introduced new Notes and Reminders apps to match the ones on iOS, and provided you've activated these items to sync in the iCloud settings, any new notes and reminders that you make on your iPhone will be synced to your Mac and vice versa. The Reminders app in Mountain Lion supports the ability to set location-based reminders that are triggered on your iPhone, but you'll need to enable location services on your Mac beforehand – go to 'System Preferences > Security & Privacy > Privacy > Location Services', and select 'Reminders'.

iPhoto syncing with the iPhone's Photo Stream isn't a new feature (it debuted with iOS 5), but it's now seamless in Mountain Lion. Assuming you've already signed in to your

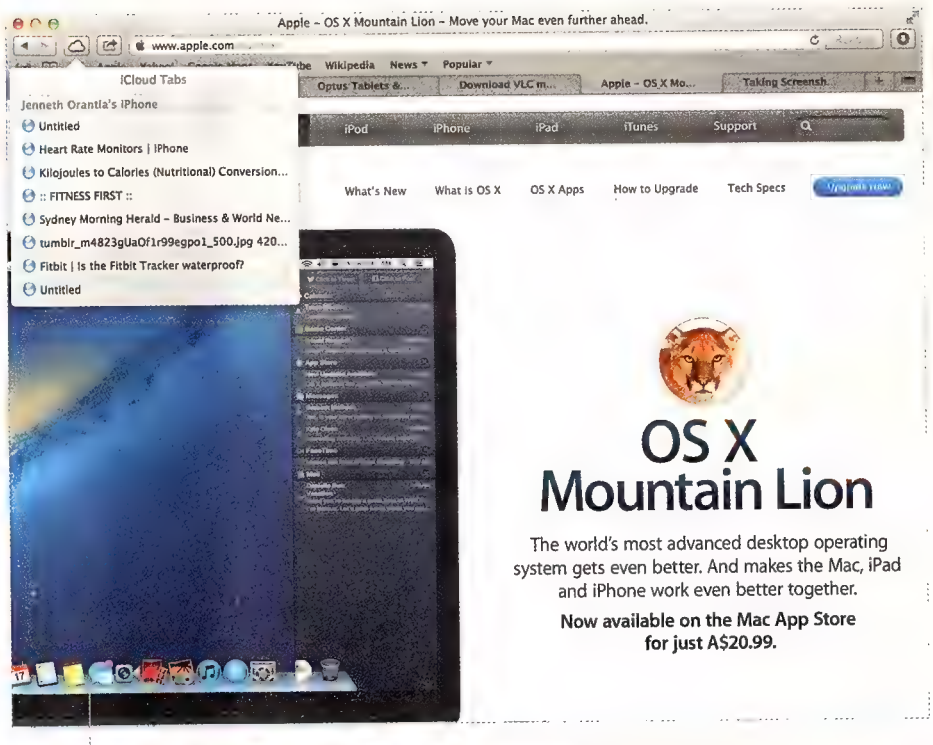


Any messages you send and receive via iMessage will now appear on your Mac, too.

Sync Reminders with your Mac via iCloud and use Location Services via your iPhone.



iTunes pushes new purchases to all your Apple devices.


Apple – OS X Mountain Lion – Move your Mac even further ahead.
www.apple.com
iCloud Tabs
Jenneth Orantia's iPhone
Untitled
Heart Rate Monitors | iPhone
Kilojoules to Calories (Nutritional) Conversion...
:: FITNESS FIRST ::
Sydney Morning Herald – Business & World Ne...
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Fitbit | Is the Fitbit Tracker waterproof?
Untitled
iPod
iPhone
iPad
iTunes
Support
What's New
What is OS X
OS X Apps
How to Upgrade
Tech Specs
OS X
Mountain Lion
The world's most advanced desktop operating system gets even better. And makes the Mac, iPad and iPhone work even better together.
Now available on the Mac App Store for just A$20.99.

You can even synchronise your open Safari tabs between your Mac and iDevice.

The Game Center is also synced, so you can switch between your Mac and mobile devices seamlessly.

iCloud account from a few paragraphs ago, iPhoto will automatically display any photos and videos in your iPhone's Photo Stream. It works the other way as well – any photos you import from a digital camera to your Mac will be added to your Photo Stream and appear on your iPhone, saving you the hassle of having to transfer the albums manually through iTunes. (Note: your Photo Stream is only updated when your iPhone is connected to a wireless network.)

If you've never used Pages before, Mountain Lion's 'Documents in the Cloud' feature may very well persuade you to make the switch. By default, all new documents in Pages (in both the iOS and Mac versions) are saved to iCloud, and any changes in those documents are synced to all of your Apple devices. This means you can start a Pages document on your Mac, switch to your iPhone to continue working on it and then go back to your Mac to finish that same document – a process that saves you from having to email the file back and forth to yourself or rely on third-party cloud storage services like Dropbox. The other cool thing about Pages is that it syncs documents to iCloud even when you haven't hit the 'Save' button.

One of the coolest new features in the latest version of Safari, which debuted with Mountain Lion, is iCloud Tabs. Clicking on the cloud icon next to the address bar in Safari displays the Safari tabs open on other devices that are connected to your iCloud account, letting you pick up where you left off on your iPhone or iPad web browsing. iOS 6 adds the ability to see your iCloud Tabs on your iPhone/iPad as well, so you can do the opposite and continue your desktop browsing session from any of your mobile devices.

If you use Game Center on your iPhone, you'll be pleased to know that it's now available in Mountain Lion as well. Once you log in with your Apple ID, you'll be able to see all of your Game Center games, friends, leaderboards and achievements. If you have multiplayer games that are available for both Mac and iOS, you'll be able to play friends on either of those platforms interchangeably, as well as make use of the in-game voice chat feature. However, there are only a handful of games that support both platforms at the moment and these include *Real Racing 2*, *Cut the Rope*, *Warzone Earth* and *Sky Gamblers*.

The many faces of the iPad

A well-chosen accessory can turn your iPad into virtually anything.

APC EXPERT

JENNETH ORANTIA

Jenneth Orantia has been writing and obsessing about mobile technology for nearly a decade. Her first iDevice was a Compaq iPAQ, and counts jailbreaking and installing custom ROMs as two of her favourite hobbies.

One of the best things about the iPad is how malleable it is. Essentially, it's a blank slate that transforms into whatever app you're currently running on it. The transformation is even more powerful when you pair the iPad with particular accessories.

TURN IT INTO A LAPTOP

There are dozens of keyboard accessories available for the iPad that transform it into a laptop, but our favourite is the Logitech Ultrathin Keyboard Cover (**www.logitech.com**, $99.95). Not only does it protect the iPad's screen while in transit (with the same magnetic Smart Cover functionality of the official Apple case), but it also has a full QWERTY keyboard built in that connects to the iPad wirelessly over Bluetooth. The most remarkable feature, however, is how thin it is – when covering the iPad, it only adds an extra 8mm.

KITCHEN APPLIANCE

The iPad is brilliant at keeping cooks company. Between the numerous cookbook apps available (such as BigOven, Jamie's Recipes and The Photo Cookbook) and the ability to play YouTube, videos and music in the background, it's a device that seems destined for the kitchen. The only issue is keeping it safe against the inevitable spills and sprays of preparing food and this is where the Belkin Kitchen Cabinet Mount (**www.apple.com/au**, $49.95) comes in handy. It clamps onto any cabinet or shelf using an adjustable clamp (keeping it clear of the counter), and you don't need any special tools to attach it.

WALL-MOUNTED COMPUTER

It's a little disappointing that we're in the year 2012 already and wall-mounted computers aren't yet the norm. However, you can turn your iPad into one relatively easily (and cheaply) using the Wallee Case and matching Wall Mount Disk (**www.thewallee.com**, $39.95 and $10). The Wallee Case snaps onto your iPad and the Wall Mount Disk needs to be screwed into the wall. The case then connects to the Disk and you can orient your iPad in landscape or portrait mode. The Wallee Case works with a variety of other accessories as well, such as an iMac-style Pivot stand ($59.95) and a Vesa adapter ($14.95).

BACKSEAT TV

Can't keep the kids quiet in the car? You can turn your iPad into a rearview monitor using the Griffin CinemaSeat 2 ($49.95). This wraps around the headrest and stops your children from bickering over who gets to hold your iPad. It's even better if you have a baby or a kid who's too young to know how to use an iPad, as you can set it up with the right app or video player before you start driving.

ALARM CLOCK

The iPad paired with the iHome iD38 (**www.techbuy.com.au**, $149.95) and corresponding iHome+Sleep app (free from the App Store) gives you the most advanced alarm clock system ever. It does the basics like charge your iPad and let you wake up to a song of your choosing. It also has numerous alarm settings (such as a 'Gentle wake' option for troubled sleepers) and displays a customisable full-screen clock display.

The Griffin CinemaSeat 2 wraps around your car seat's headrest to turn your iPad into a rearview monitor.

The Belkin Kitchen Cabinet Mount will keep your iPad clear of the counter.

Root your ICS handset

You're not an Android power user until you root your handset.

PC EXPERT

SIMON CHESTER

An Android enthusiast since the days of the Dream, Simon has watched the fledgling OS grow from curio to juggernaut, and has rooted, ROMed and tweaked more devices than is polite to speak of. Join him as he shows you how to make the most of that Android powerhouse in your pocket.

All the cool kids root their Android phones and not just because it's fun to say. Rooting, a term derived from the root privileges normally not granted to end users, gives you system-level access, meaning you can remove any unwanted carrier crapware, run backups/restores of your apps, disable the camera shutter or other system sounds and much, much more. While it technically voids your warranty, it's become standard practice for any Android device I own (if you're clever, you can always un-root and clean your footprints before you make any warranty claims anyway).

I've not yet written a 'how-to' for rooting a handset/tablet because there are many different ways to do so for the many different devices and none are universal. However, this month I came across a near-universal method that should work on any Ice Cream Sandwich (Android 4.0) device. The reason is that it's purely a root method – it doesn't install a new kernel.

First up, head over to **tinyurl.com/4xsk6f6** and download a 'Recovery' for your device. The Recovery is a sort of mini-OS that you boot into on your device to do things like make/restore backups and flash ROMs. The only one worth your time is ClockworkMod (CWM).

You'll also need a special SU + Busybox package to install from CWM Recovery. You can download an appropriate one from **db.tt/zW591p6W**. SU is the Super User app that will manage which apps are granted root access (a security measure so rogue apps can't bork your device unless you explicitly give them permission to do so) and BusyBox (**www.busybox.net**) is a collection of handy Unix utilities that will give some powerful capabilities to your device, which many root-only apps require to run properly.

Once you have both of these files, place them in the root directory of your SD card and reboot into Recovery. On my Galaxy S II, I do this by turning off my handset then holding Volume Up+Home+Power, but this will differ from handset to handset, so do a quick Google (or XDA-Developers Wiki) search to find out how to do it on your particular handset.

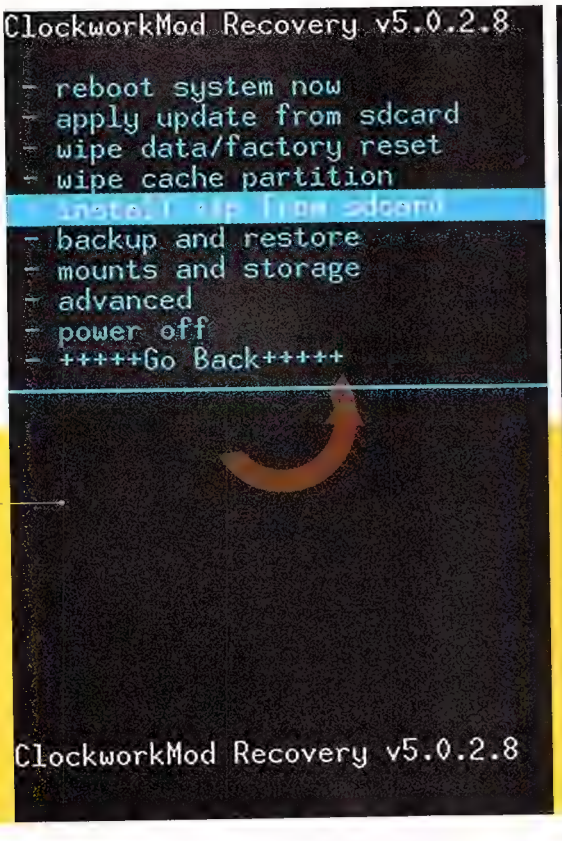
Once in Recovery, you need to select 'Apply update from external storage' and select CWM.zip. This should install CWM, then reboot the phone and enter your new and more powerful CWM Recovery. This is a good time to run a backup of your phone, so select 'Backup and Restore' and then 'Backup'.

Once the backup is complete, choose 'Install zip from sdcard' (or 'external SD', depending on your handset) and choose and install 'SU-Busybox-Installer.zip'. Then reboot.

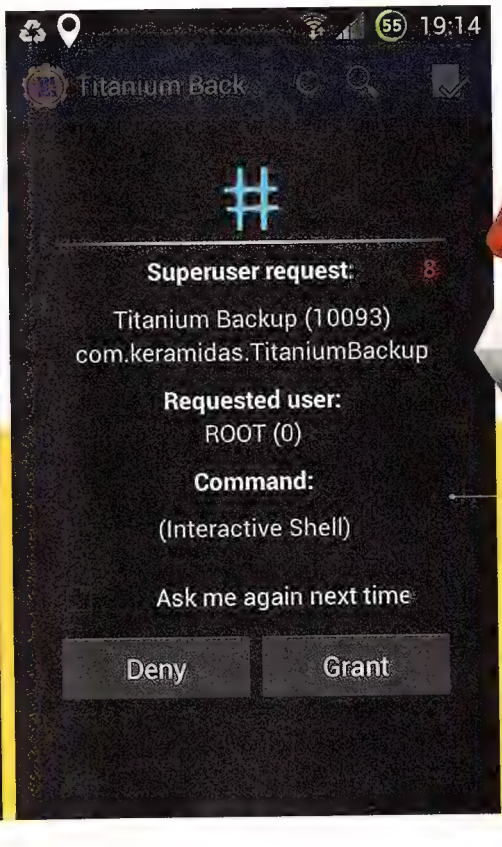
Your phone will then be rooted. I would recommend installing (from Google Play) Titanium Backup, as it not only allows you to back up/restore your applications, settings and data, but also allows you to remove/freeze any crapware from your phone.

You'll notice that when you first run an app that requires root, an SU dialogue will appear. Unless you specify otherwise, you'll only have to grant access once per app and sometimes, once again after an app upgrade.

Many thanks to Rachmat3 from XDA-Developers for the files and information (**tinyurl.com/cxqn34a**).



The ClockworkMod Recovery allows you to back up and restore your phone.



The Super User app manages which apps are granted root access on your Android phone.

Stream content to your Apple TV

Apple TV is great value, but Android users need not miss out on a key feature.

APC EXPERT

SIMON CHESTER

An Android enthusiast since the days of the Dream, Simon has watched the fledgling OS grow from curio to juggernaut, and has rooted, ROMed and tweaked more devices than is polite to speak of. Join him as he shows you how to make the most of that Android powerhouse in your pocket.

When the Apple TV 2 first came out, it blew away the competition in terms of value for money – no media streamer had offered such a refined interface at such a low price point. The Apple TV 3 continued that tradition, adding in 1080p support and dropping the price even further. Excluding the Raspberry Pi, it remains the best-value TV-connected media device on the market.

But it's an Apple product, which means it's tethered to the Apple ecosystem of iTunes and iOS. In fact, one of the (in my opinion) greatest features of the Apple TV is AirPlay – the ability to stream content from your iOS device to your TV (or other AirPlay-compatible devices, like speakers). Of course, as a droid-head, this is a feature I wish would work on my handset. Thankfully I'm not alone – there are a number of Android devotees busily at work creating the tools needed to bring AirPlay streaming to Android apps.

Unfortunately, there's no way (yet) to get AirPlay to work in any and every Android app – we still require the developer to add explicit support, so for the time being you'll need an app with explicit AirPlay support.

The king of the AirPlay-compatible Android apps is doubleTwist Player (initially free), which for an additional $4.99 enables you to send your pictures, movies and music to your Apple TV (or your Xbox 360, PS3 or Sonos player). To do this, click on the 'Add Features' icon on the 'Music' screen and then purchase either the AirSync add-on or the Pro version.

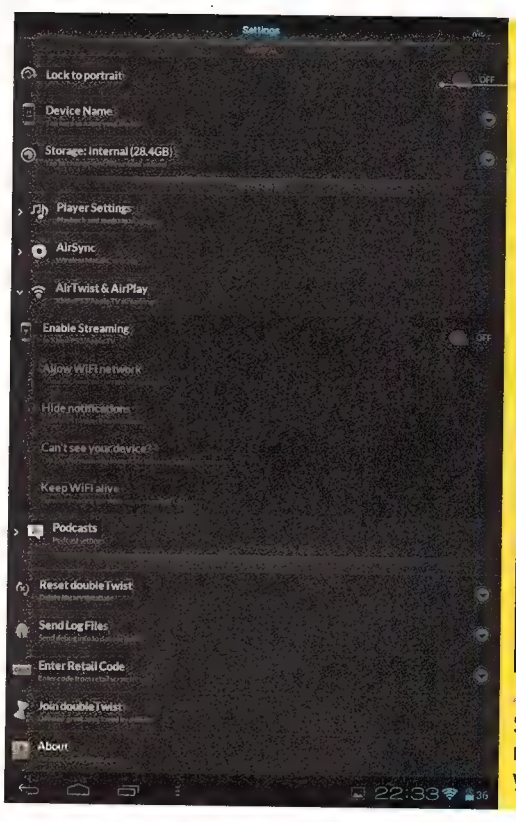
After that's installed, you then need to scoot on over to 'Settings > AirTwist & AirPlay' and enable streaming. A dialogue box will pop up asking if you'd like to approve the current Wi-Fi network for AirTwist. If you're on the same network as your Apple TV, hit 'Allow'.

Then when you play music (in portrait mode only) or video, you'll see a beam-like icon. Click on it for a menu to select the device you wish to play the content on. This is where you select your Apple TV. Note that with video it can only display on one device at a time, meaning your Android screen will go blank.

To share images to your Apple TV, open up the image in any image browser, click on the Android 'Share To' menu and select 'doubleTwist AirTwist' and then your Apple TV.

If you're security conscious or paranoid, note that passwords aren't supported so you'll have to disable them on your Apple TV. More help and information is available at **tinyurl.com/9c7bvcn**.

If you're not keen on doubleTwist, you could try Twonky Mobile, which also supports sending videos between Android handsets and sending web streams to your Apple TV or other UPnP/DLNA devices. There's also iMediaShare, which does much the same thing as Twonky Mobile, sans device-to-device streaming. Honey Player is another one, but it only supports audio. And for those who like to mix it up, AirBubble allows you to stream content over AirPlay to your Android device and is a cheap and easy way to create smart speakers from an old handset.



Delve into 'Settings' to set up Apple TV playback on your Android device.

Send pictures, movies and music to your Apple TV from your Android tablet.

doubleTwist Player is AirPlay compatible.

Twonky Mobile allows you to send video and web streams.

ANDROID

10 cool things to do with an Android camera

Nick Odantzis opens up a world of amazing things you can do with your camera.

YOU'LL NEED THIS

ANDROID PHONE

You'll need a smartphone running Android 2.1 (Eclair) or higher. Some apps also require extra features, like a front-facing camera.

01 SEARCH FOR ANYTHING, ANYWHERE

As much as you might hate Google for its neverending bid for world domination, you've got to hand it to the search giant – it really knows how to come up with the goods. For example, take its latest application, Google Goggles. Designed for Android 2.1 and newer, it's basically a barcode or QR code reader if it were made by the Incredible Hulk.

Instead of relying on scanning bits of information on the side of a packet specifically created to be recognised by the app, Google Goggles can be used to scan absolutely anything – and the beauty of it is that there's not a code in sight. Simply point it at what you want and it will pull information relevant to it straight to your phone. If it's a famous landmark like Sydney's Opera House, it'll beam you a complete history of the building. It works for artwork, drinks, logos and much more.

02 PLAY AUGMENTED REALITY GAMES

Augmented reality in phones has been around for a while and tools like AR translation apps are great, but nobody ever seems to show you how to use the technology for fun. That shouldn't stop you using your phone's ability to play augmented reality games, though, no matter where you are.

There are plenty of them about, like *SpecTrek* – the game where you search for virtual ghosts using a map and then shoot them down when you find them. Or there's *Zombies, Run!* where you have to get from A to B on a map, avoiding those pesky flesh-eaters en route.

A word of warning: be very careful about running around and shooting at things in a city filled with real people, as you might get some funny looks, especially if you're old enough to know better.

03 CATCH CRIMINALS

Perish the thought of ever losing your phone or having it stolen, but it could very easily happen to you one day. Gotya is an app that takes advantage of your Android handset's camera to catch a light-fingered fiend in the act by snapping a photo of them when they try to bypass your phone's security login screen. It then not only emails the picture to you instantly, but also tells you the thief's location, so you can tip off the police to their whereabouts.

Obviously, the only way this idea would ever actually work would be if your phone comes with a front-facing camera, there's mobile internet access available and you actually remembered to turn on 3G in the first place. Otherwise, it's absolutely foolproof.

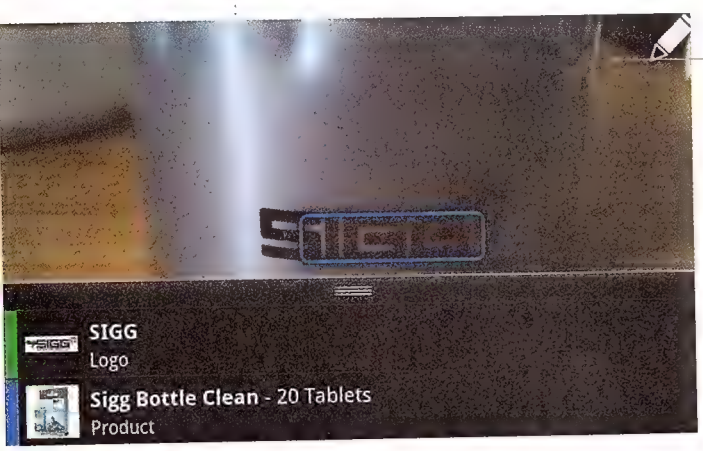
04 LOOK TO THE STARS

While few of us can ever boast to be blessed with the same sort of abilities as Brian Cox or Sir Patrick Moore, we can still revel in all that the stars have to offer from the comfort of our own homes (or gardens, anyway) thanks to apps like Star Chart and Google SkyMap.

Using AR, they allow you to point your phone skywards at night and get a fascinating overview of all those little lights. SkyMap gives you the names of stars and tells you where to point your phone to see certain planets. You'll feel like a Greek god in no time.

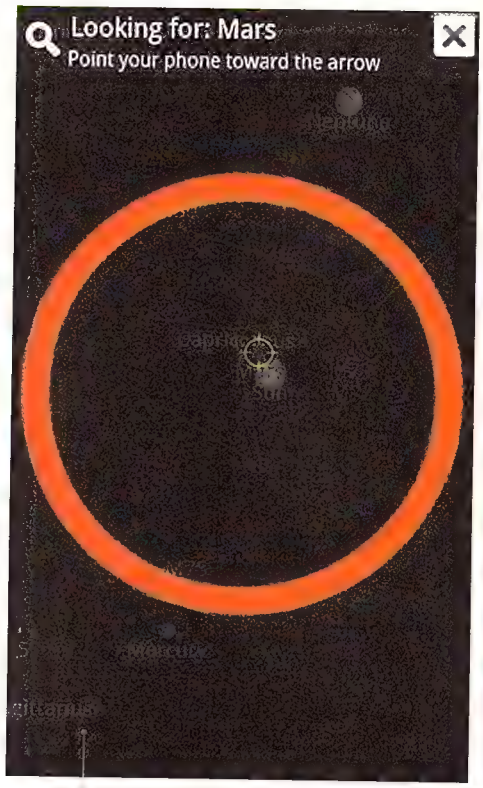
05 TURN YOUR PHONE INTO A WEBCAM

Your smartphone's camera doubles as a handy video camera – most newer phones can even record in high definition – which you can use to shoot videos on the move. But that

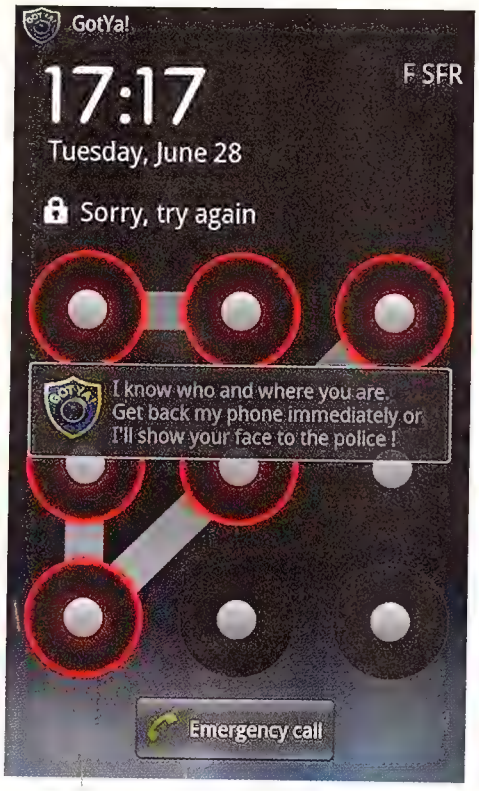


Google Goggles scans objects and provides information about them.

Augmented reality games like *SpecTrek* are a fun way to get some exercise.



SkyMap helps you identify celestial bodies at night.



Gotya is designed to catch phone thieves who try to access your device.

The app uses a phone's camera to capture a picture of the criminal.

wouldn't be very revolutionary, would it?

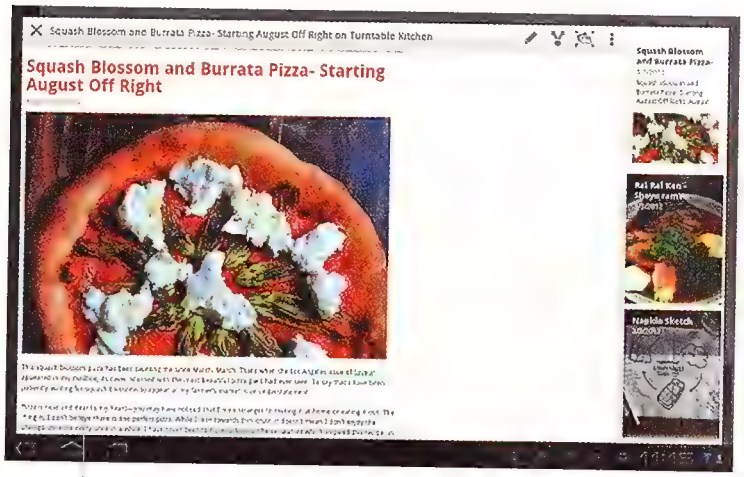
If you want to make more of your mobile hardware, why not stream your videos live to the world (or even just a couple of close friends) using Bambuser instead? Provided you have a decent internet connection where you are – and no, we didn't believe those promotional snowboarding videos either – you can broadcast videos as you record them, which would be great for parties or any kind of activity/event where someone couldn't be there. You can even geotag your live stream and then share it with your entire social network, so that everyone knows exactly where you are!

06 SAVE PHOTO NOTES

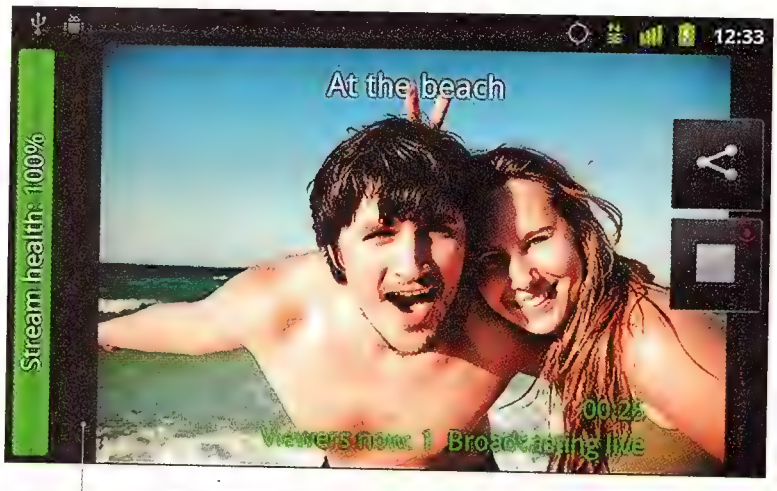
Probably one of the most underrated features of a phone is the ability to take notes at random whenever something happens to pop into your head. You can go one step further than basic note taking and start using the power of your camera plus the Evernote app to take picture notes, too. The real beauty of this is that anything you snap which contains text will be recognised by Evernote, allowing you to categorise the picture and search the text later, so it effectively writes notes for you. It's great if you want to digitise your shop receipts or scan a great article in a magazine for later.

07 GET NOTIFICATIONS VIA CAMERA FLASH

The main use for your phone camera's flash is taking pictures in low light, naturally, but some people also use it as a torch to find their way at night. It can even be used as an extension of the ringer and vibrate function when you receive calls by installing the FlashBlink app, so if all else fails and you can't hear your phone, you'll certainly be able to see the flashing light emitting from it. The app isn't available off the shelf, so don't go rooting around Google Play because you won't find it. Instead, find out how to use it in the tutorial on page 98.


Squash Blossom and Burrata Pizza- Starting August Off Right on Turntable Kitchen
Squash Blossom and Burrata Pizza- Starting August Off Right

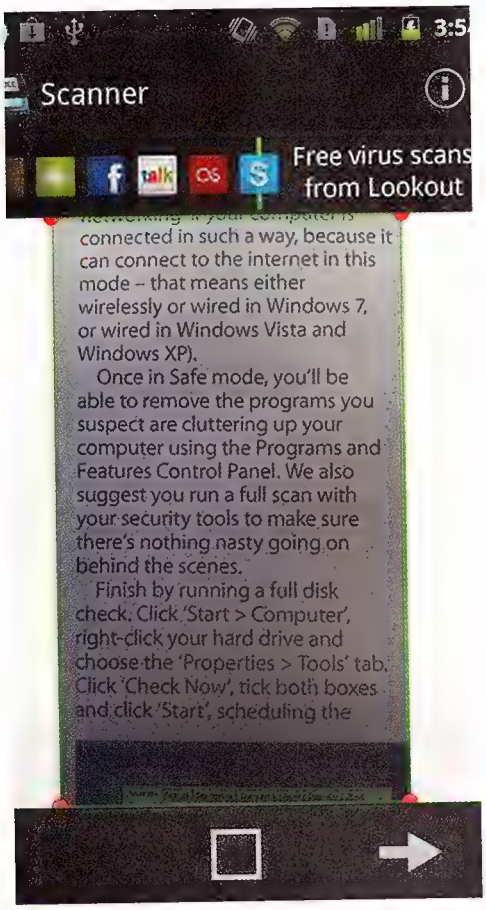
Evernote helps you jot down thoughts and ideas so you can access them at a later date.



Your smartphone's camera can stream video live to social networks, enabling friends and family to see what you're up to.

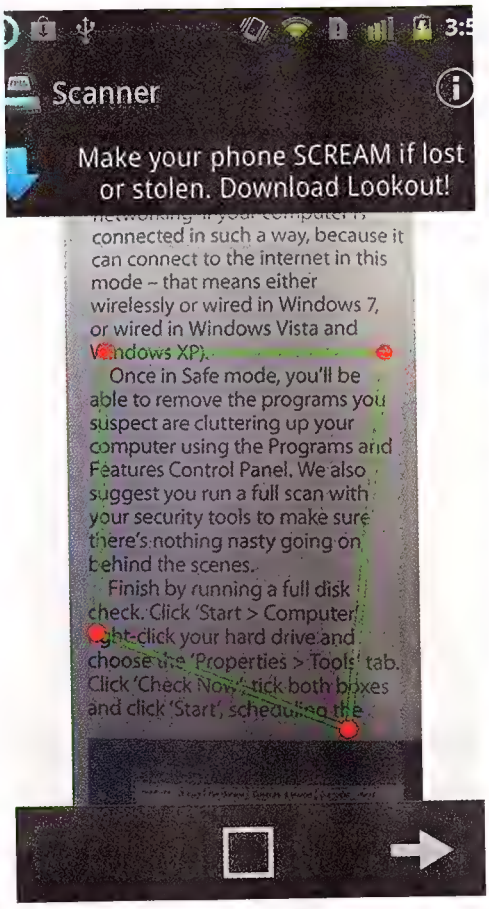
MOBILE SCANNING

Copy printed documents to PDF.


Scanner
Free virus scans from Lookout
connected in such a way, because it can connect to the internet in this mode – that means either wirelessly or wired in Windows 7, or wired in Windows Vista and Windows XP).
Once in Safe mode, you'll be able to remove the programs you suspect are cluttering up your computer using the Programs and Features Control Panel. We also suggest you run a full scan with your security tools to make sure there's nothing nasty going on behind the scenes.
Finish by running a full disk check. Click 'Start > Computer', right-click your hard drive and choose the 'Properties > Tools' tab. Click 'Check Now', tick both boxes and click 'Start', scheduling the

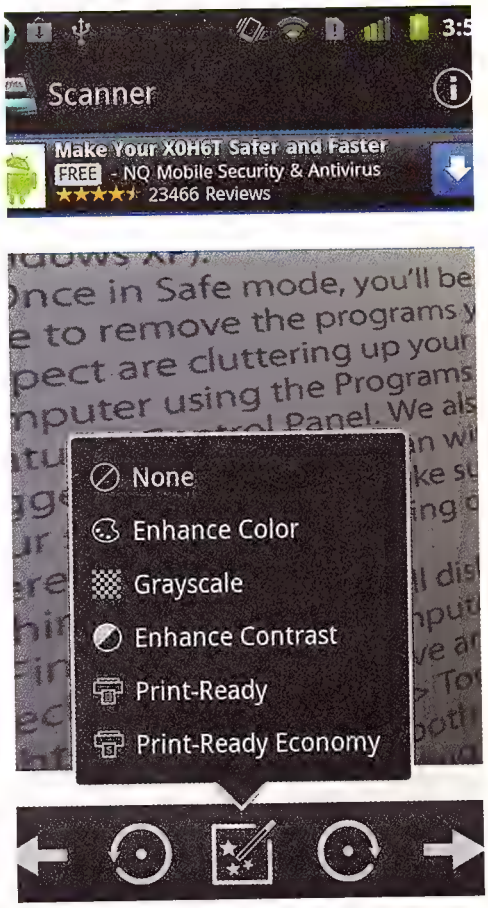
01 SNAP A DOC

Download Handy Scanner Free PDF Creator from Google Play, open it and tap the camera icon in the upper menu. Aim your camera at a document and then tap the shutter button to capture the photo. Tap the 'Done' button once you've finished. Handy Scanner will then show you a preview of the image you've snapped.


Scanner
Make your phone SCREAM if lost or stolen. Download Lookout!
connected in such a way, because it can connect to the internet in this mode – that means either wirelessly or wired in Windows 7, or wired in Windows Vista and Windows XP).
Once in Safe mode, you'll be able to remove the programs you suspect are cluttering up your computer using the Programs and Features Control Panel. We also suggest you run a full scan with your security tools to make sure there's nothing nasty going on behind the scenes.
Finish by running a full disk check. Click 'Start > Computer', right-click your hard drive and choose the 'Properties > Tools' tab. Click 'Check Now', tick both boxes and click 'Start', scheduling the

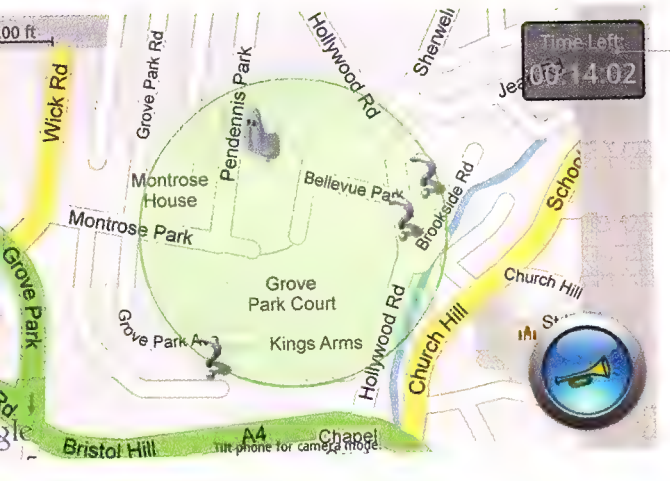
02 ADJUST THE IMAGE

An outline of the words it has recognised will be shown. If you want to change the outline, you can drag the corners of the box and move it around for a more accurate position. Tap the right arrow button once you're satisfied. On the next screen you can change the orientation of the image by tapping on the left or right circles.



03 SAVE & THEN SHARE

Alternatively you can adjust the image using the magic button in the centre of the lower menu bar. If you're planning to print the image, select 'Print-ready'. Tap the right arrow and give the document a name. The new scan will then be saved. To share it, tap the 'Share' button in the right of the upper menu and select whether to 'Dropbox it', 'Bluetooth it' or send it to 'Cloud Print' for printing.



Locate ghosts on *SpecTrek*'s map, then hunt down and destroy them.

Point your phone's camera at the sky and SkyMap labels the constellations for you. You can also use it to find planets you're interested in.

If you want to save a printed document, scan it with your phone.

08 TRANSLATE TEXT

Once again, Google Goggles comes to the rescue. Out of all the picture-to-text translator apps out there, it's hands-down the best of them. Just hover your phone's camera over an image of some text, snap a photo and Google Goggles will automatically recognise if the text is in a foreign language and attempt to analyse and translate the image for you. Imagine being in a restaurant in Paris and you want to avoid eating frogs' legs – this could be very useful.

09 FIND HIDDEN STUFF AROUND YOU

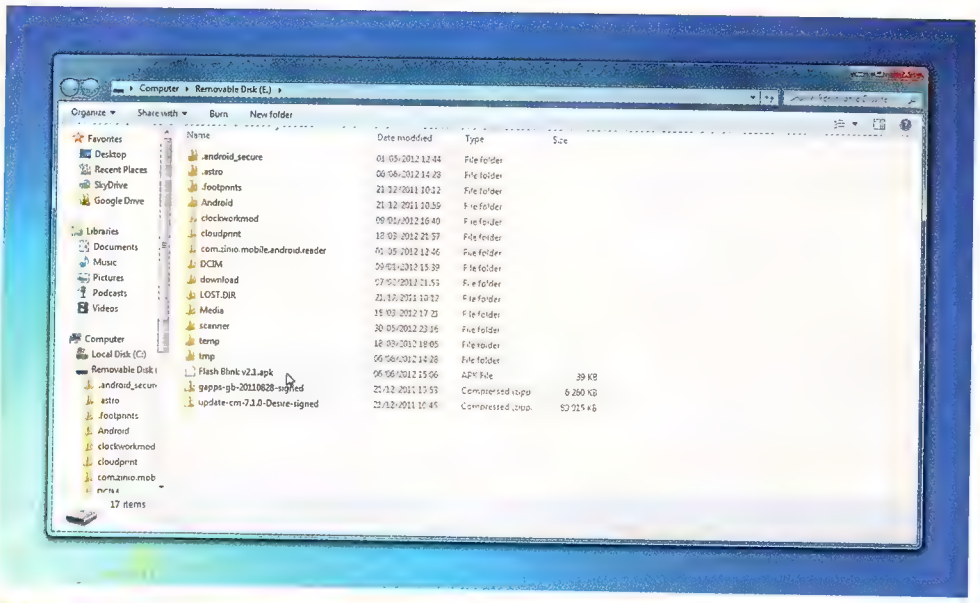
Thanks to augmented reality technology, you can discover a world of pretty interesting things right outside your front door using apps like Junaio and Layar. What they basically do is reveal things on your phone that you wouldn't be able to see using your eyes, like events that are going on or where to find discounts nearby. It will even point you in the direction of essential information, like the nearest ATM or train station.

10 SCAN DOCUMENTS

Another great feature available is the ability to convert documents into printable PDFs, simply by using an app like Handy Scanner, which snaps a photograph and then magically turns it into a PDF. You then have the option of emailing the PDF or putting it in a Dropbox folder. Alternatively, Google Drive does much the same thing, but instead of creating a PDF out of printed text, it will convert it to a Google Docs file.

FOLLOW THE LIGHT

Use camera flashes to notify you of calls.

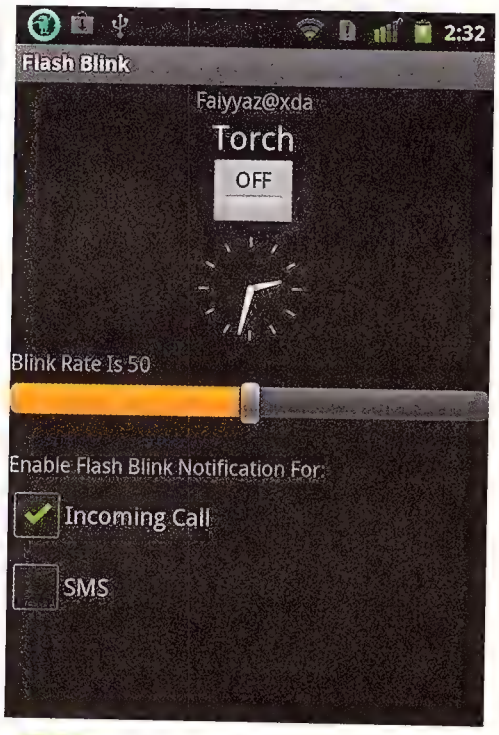


01 GET THE SOFTWARE

To download Flash Blink 2.1, go to **tinyurl.com/7znrato** and click on 'Flash Blink v3.2' next to 'Download link'. Install the app from MediaFire and copy the .APK file to your SD card – just put it loose in the root directory.

02 INSTALL THE FILE MANAGER

Before you can do anything with the .APK file, you'll need to install ASTRO File Manager, which you can find on Google Play. Download and install this first. Once you've done so, open ASTRO, browse to the .APK file once more, tap it and then select 'Open file manager'. Click 'Install' and then just wait for the process to finish.



03 TRY IT OUT

Now that it's installed, you can simply open the Flash Blink app like any other in your list of apps. To get it to work, simply turn on the torch and tap the check box next to where it says Enable Flash Blink Notification – you can choose it to flash when you receive a call, a SMS or both, and you can even choose how fast the light flashes.

LINUX

Install a personal web server

You don't need to be a system administrator to run your own web server, says Graham Morrison.

YOU'LL NEED THIS

DECENT UPLOAD BANDWIDTH
Your server will be accessible from the internet and this will make it more responsive.

A STATIC IP ADDRESS FROM YOUR ISP
If you don't have one, you can use a third-party DNS forwarding site like DynDNS (**dyn.com/dns**).

UBUNTU SERVER 12.04
We've chosen this as our Linux distribution. You'll also need a machine to put it on. Download it from **tinyurl.com/7ukjtwt**.

Paying someone to host your web site can be tempting. There's usually a point-and-click installation for any services you require, plus cheap monthly prices that include storage and maintenance, and there are often generous bandwidth allowances, too. It's not much fun, though, and if you want to add any advanced features, such as shell access to your server or a non-shared host, costs soon ramp up.

SERVE YOURSELF

The solution to all of these problems is to run your own server, and it's not as difficult or insecure as you might think. With the latest version of Ubuntu, for instance, you can install the Apache web server with just a couple of clicks and because this is the LTS (long-term support) version, you'll receive five years of security updates for free (the desktop version is only supported for three years). As long as your system is up to date and your passwords are secure, it's highly unlikely that anyone will be able to break into it.

Combine this with the upload speeds many people enjoy at home and you've got a viable alternative to cheap shared hosting that's fun to install, gives you more control over the configuration, and is better suited to the low-bandwidth sites many of us like to run as a hobby.

You'll also learn a lot in the process. That's why we're going to show you how easy it is to create a Linux server, install a LAMP stack into it, get Apache running and serving web pages, and then install the world's most popular content management system, WordPress. After that, world domination is up to you and your cookery/1980s platform games/analogue monosynth blog.

Unlike the live desktop CD that most regular users use to install Ubuntu, the Server edition gets you prepared for life on the command line by keeping to it. This isn't as bad as it sounds because it's really just a series of menus. You're also asked almost exactly the same questions as for the desktop version, so there's no extra skill required.

Boot from the Ubuntu server CD and choose 'English' and 'Install Ubuntu Server' from the options that appear. Select your language again, your time zone and then your keyboard layout.

After a brief configuration delay, you'll get to the networking section. First, it asks for a hostname; you just need to make sure this is a unique name rather than letting all the machines on your network use 'ubuntu'. Enter a username and password. You want to make these as secure as possible – using an unpredictable name and a difficult password, for example – because you don't want someone guessing the values if you run SSH for remote access.

PARTITIONING

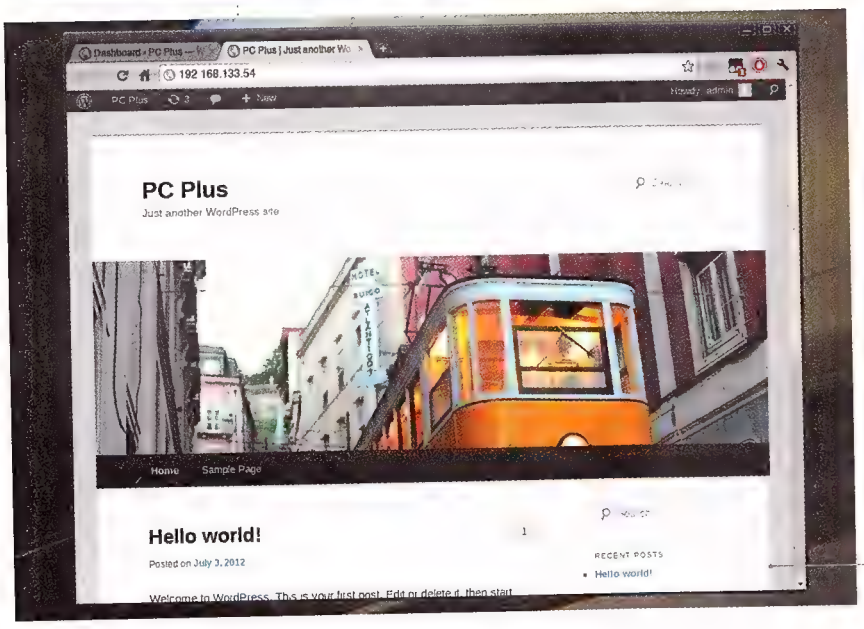
The next major step is disk partitioning and the most straightforward approach is to give the server a complete disk. We also recommend the second option from the disk partition menu, as this formats the complete disk with an LVM configuration. LVM is a disk management system that creates virtual partitions from one or more disks, and it means you can easily expand them as your needs grow, without the tedious tasks of migrating data from one drive to another. Answer further questions with their default values. Be warned, this will remove any data on your chosen drive. Leave the package management proxy question blank, but in the following question we suggest 'Install security updates automatically' is a better choice than the default one, especially if you're going to leave the machine running and connected to the internet.

PICK A SERVER

The final stage of the installer lets you pick and choose any of the servers you might want to install. This is so Ubuntu can manage the processes from boot time without any further interaction from you, so it's a good idea to at least install the basic packages. We'd recommend selecting the OpenSSH Server and LAMP Server as a good starting configuration. OpenSSH is one of the most powerful tools available for Linux because it lets you access the command line securely from any remote location, as long as port 22

CONFIGURATION

When you make any changes to a server's configuration, usually through its configuration file, you need to restart the server for those changes to have an effect. Services have their own management scripts, which can be found in /etc/init.d. To restart IRC, for example, type sudo /etc/init.d/ircd-irc2 restart.

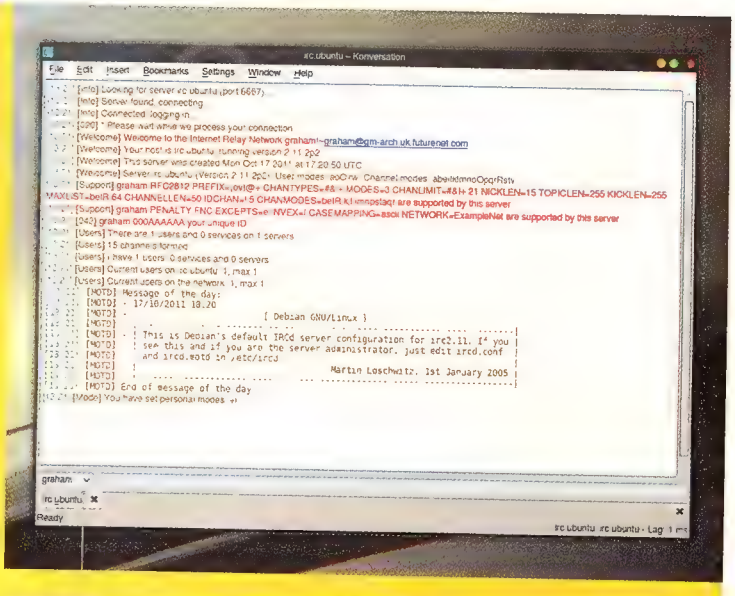


WordPress is a perfect platform for many kinds of web sites, not just blogs.

INSTALL OTHER SERVERS

SSH and Apache are only the tip of the iceberg – you can install many other kinds of servers. You might want FTP access, for example, to allow you to transfer files to and from the server. This can be done by typing `sudo apt-get install vsftpd`. After this is done, just point your favourite FTP client at the IP address of your server and you'll be able to connect anonymously. By default, the empty folder that's shared over FTP is in the /home directory. We only recommend using FTP behind a firewall on your LAN because data is usually transferred unencrypted, which could be a security risk. If you need to transfer files securely, we recommend SFTP. This requires only OpenSSH to be installed on your server, plus an SFTP-compatible client (like FileZilla). It will also use your server's user accounts, and all files and passwords are encrypted in transit.

For old-school fun, you might want to consider IRC. Despite being ancient, no other technology has come close to IRC's implementation or popularity and running your own server will give you a private corner of the internet for your friends and family. The most popular server can be installed by typing `sudo apt-get install ircd-irc2`, and you'll need to change the hostname in /etc/ircd/ircd.conf. Whatever you choose will need to be accessible from your other machines, so if this isn't a qualified domain name, add its name and IP address to the /etc/hosts file for your clients. When it's running, grab your favourite IRC client and use the hostname to connect.



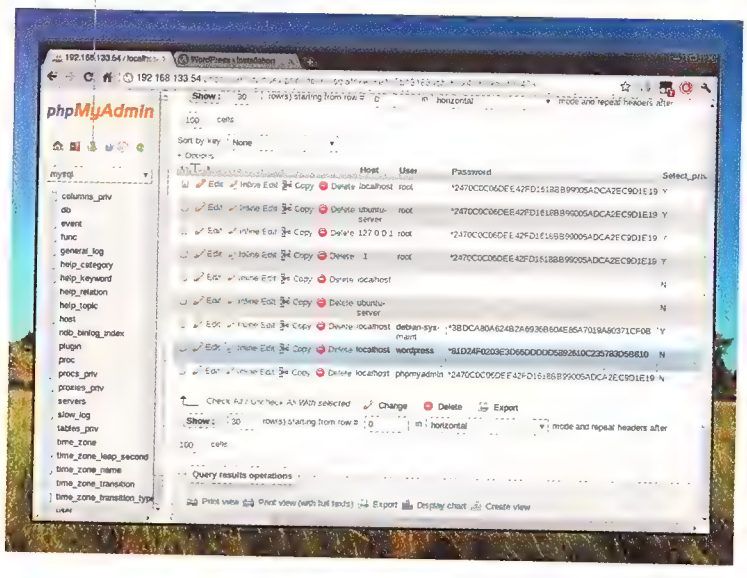
You don't often see an IRC server with a 1ms ping – unless you run it on your own network!

is forwarded to your machine through any firewall. It also means that you can disconnect the keyboard, mouse and screen after you've set up your server machine on your local network, since you'll be able to do everything else using a remote SSH connection.

You've probably heard of LAMP. It stands for Linux/Apache/MySQL and PHP, and these four technologies have helped transform the web for companies like Facebook and Twitter. Apache is the web server itself, allowing you to host sites and for them to be accessed from across the network. MySQL is a database server, commonly used by the likes of WordPress to store things like posts, comments and forum chatter. It might sound a little 'enterprise' to be installing something like this on your humble server, but it's a service that runs well on slower machines and can scale to meet your needs. You can give the installer a root password for this, which we recommend if you're going to use it online.

PHP is the programming glue that binds this together. Don't let talk of programming put you off, though. You usually install pre-baked PHP packages rather than coding your own solutions, so you'll never need to touch the code.

If you get stuck, install phpMyAdmin and visit http://localhost/phpmyadmin.



PORT FORWARDING

With your servers selected, continue with the installation. After a few minutes, the final question will ask whether you want to install the GRUB boot loader into the master boot record. You should select 'Yes' unless you're running your personal server alongside a Windows installation. You'll then be able to restart your machine and remove the bootable disc.

After restarting, you won't see a desktop or graphical login screen. Instead, you'll see a monochrome command prompt asking you to log in. Use the account credentials you created from the installer to log in, and you'll find yourself at the command line. We first want to discover the IP address of the server and this should be displayed as part of the login overview you see above the command prompt. Look for the line 'IP address for eth0'.

This IP address is important because you want to run your machine as a server. On most networks, it will be given to your machine by a DHCP server running somewhere on your LAN, usually tucked away on your router or modem. Most of the time this address will be the same, but there's no guarantee because it's allocated dynamically according to demand. With the server up and running, the easiest solution for most routers is to use its web interface to give the Ubuntu server a static

```
Ubuntu 12.04 LTS ubuntu-server tty1

ubuntu-server login: graham
Password:
Last login: Mon Jul  2 16:01:18 BST 2012 on tty1
Welcome to Ubuntu 12.04 LTS (GNU/Linux 3.2.0-23-generic-pae i686)

 * Documentation:  https://help.ubuntu.com/

 System information as of Mon Jul  2 16:09:55 BST 2012

 System load:  0.14                Processes:           73
 Usage of /:   13.6% of 7.21GB     Users logged in:     0
 Memory usage: 12%                 IP address for eth0: 192.168.133.54
 Swap usage:   0%

 Graph this data and manage this system at https://landscape.canonical.com/

67 packages can be updated.
37 updates are security updates.

graham@ubuntu-server:~$ _
```

The server's IP address is displayed when you log in for the first time.

address. Each router is different, so we can't provide instructions, but the task is usually straightforward.

While you're in the web interface, you'll also need to open a couple of ports in your firewall and then forward these to your Ubuntu server. These ports will depend on which servers you're running, but for a web server and OpenSSH, it will be ports 80 and 22, respectively.

CHECK OUT THE SERVER

This is all the configuration that's needed. You can then point a browser at the internet-facing IP address provided by your ISP or your server's IP address on the LAN. The infamous 'It works!' message will be delivered by Apache. Your server will then be ready for your web masterpiece. This isn't the place for a tutorial on HTML or PHP, but the /var/www/index.html file is a good place to start because this is what's read to create the 'It works!' messages served by Apache. Edit this file and your web site will change.

The other server we installed was OpenSSH and you can also make use of this from any SSH client – PuTTY on Windows, for example, or the `ssh` command from any Linux machine. Type `ssh` followed by the IP address of your server and you'll see the same login screen you do when you start your machine. Log in and you'll be able to do everything you can from the machine, only remotely. This means you can hide your server away somewhere and use a remote connection when you need to change things, either from the internet or from your LAN.

Most people don't build a web site from scratch (although the world might be a better place if more people had to), so we're going to install a prebuilt web framework that should make it easy to get your content online from your own server. The software we're going to install is WordPress, which is probably the world's most popular blogging platform. There's more to it than blogs, though: it's a comprehensive and easy-to-use content management system that can be easily augmented and themed using its fantastic plug-in system. All it needs is Apache, MySQL, Linux and PHP, all of which we've already covered.

INSTALL WORDPRESS

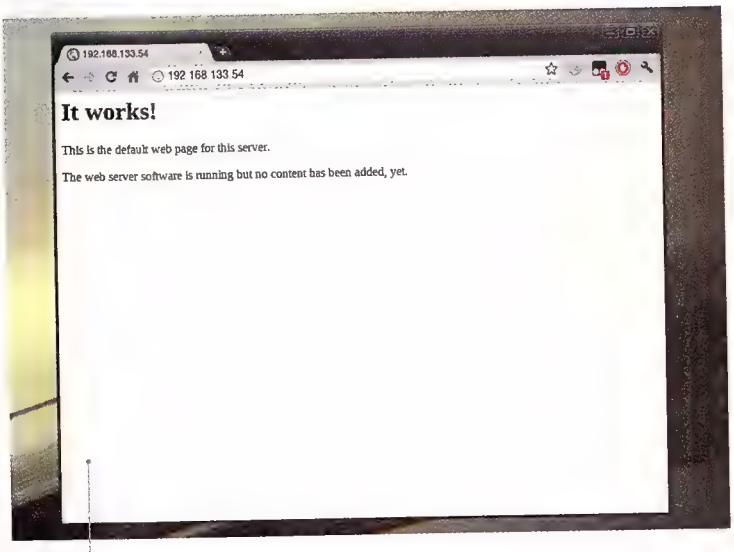
The first step is to grab the Ubuntu packages for WordPress by typing `sudo apt-get install wordpress`. Unfortunately, this doesn't include any configuration. Once the packages are installed, we first need to create a symbolic link from the folder where WordPress is installed to the folder that Apache is using to serve content. This can be done by first removing the old www folder with the command `sudo rm -rf /var/www`, and then replacing it with the link by typing `sudo ln -s /usr/share/wordpress /var/www/`. We then need to run a script that will create the MySQL database for us automatically. This can be done with the following command: `sudo bash /usr/share/doc/wordpress/examples/setup-mysql-n wordpress 192.168.133.54`

Here, `wordpress` is the username for the database and `192.168.133.54` is the IP address of the server from which you need to access it. If you want access from the internet, it needs to be your connection's IP address rather than that of the server on your LAN.

With a bit of luck, when you point your browser at the server, the 'It works!' message will have been replaced by the WordPress installation screen. The final steps are to walk through this easy installation to build your required setup. Just enter a site name, email address and password. A few moments later, you'll find yourself with a fully fledged WordPress installation. Log in and start playing.

DOMAIN NAMES

If you want a proper domain name for your server, you'll have to buy one, either from your DNS forwarding service or from a registrar such as GoDaddy (**www.godaddy.com**). The registrar route is far more professional, but you'll need a static IP address and the ability to use its web interface.


192.168.133.54
192.168.133.54
It works!
This is the default web page for this server.
The web server software is running but no content has been added, yet.

Apache will give you a confirmation page when your server is set up.

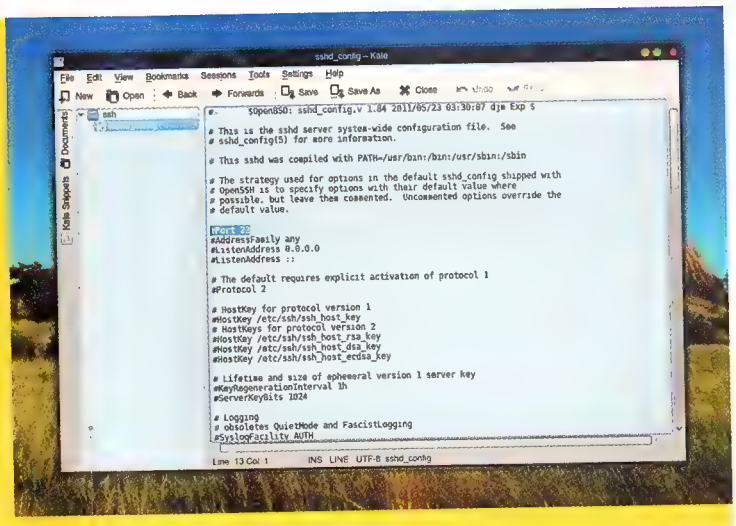
SECURITY

When running a service that's accessible from the internet, make sure each service is managed rather than left to run wild. By that we mean you use a firewall to only allow access to the ports you need – port 80 for web traffic, for instance, and port 22 for SSH – and that you keep those services up to date.

Ubuntu is brilliant for this because the installer can configure itself to make package updates automatic. With updates and patches installed, running a web server from your machine is no more risky than doing anything else on the internet. You just need to make sure that you use a little caution.

For remote administration, SSH is very secure, but it relies on the strength of your passwords and usernames. If these can be guessed, and your user account can be used to gain administrative access, your server can easily be subverted and turned into a spammer's tool. One of the best tricks you can perform with SSH is tunnelling a port from your LAN to the internet through your SSH connection. This will allow you to access Apache or FTP without having the ports forwarded through your network or running publicly.

To do this, use the command `ssh -L 8000:localhost:80 username@server` and port 80 will be tunnelled through your firewall to port 8000 on your client machine. You then need to point your local browser at **http://localhost:8000** to see the remote web page.


sshd_config – Kate
File Edit View Bookmarks Sessions Tools Settings Help
New Open Back Forwards Save Save As Close
Documents
Kate Snippets
$OpenBSD: sshd_config,v 1.84 2011/05/23 03:30:07 djm Exp $
This is the sshd server system-wide configuration file. See
sshd_config(5) for more information.
This sshd was compiled with PATH=/usr/bin:/bin:/usr/sbin:/sbin
The strategy used for options in the default sshd_config shipped with
OpenSSH is to specify options with their default value where
possible, but leave them commented. Uncommented options override the
default value.
Port 22
#AddressFamily any
#ListenAddress 0.0.0.0
#ListenAddress ::
The default requires explicit activation of protocol 1
#Protocol 2
HostKey for protocol version 1
#HostKey /etc/ssh/ssh_host_key
HostKeys for protocol version 2
#HostKey /etc/ssh/ssh_host_rsa_key
#HostKey /etc/ssh/ssh_host_dsa_key
#HostKey /etc/ssh/ssh_host_ecdsa_key
Lifetime and size of ephemeral version 1 server key
#KeyRegenerationInterval 1h
#ServerKeyBits 1024
Logging
obsoletes QuietMode and FascistLogging
#SyslogFacility AUTH
Line 13 Col 1 INS LINE UTF-8 sshd_config

You can harden SSH by editing the /etc/ssh/sshd_config file. Try changing the default port, for example.

WINDOWS

Automate regular tasks

Mayank Sharma shows you how to save time by using Task Scheduler.

YOU'LL NEED THIS

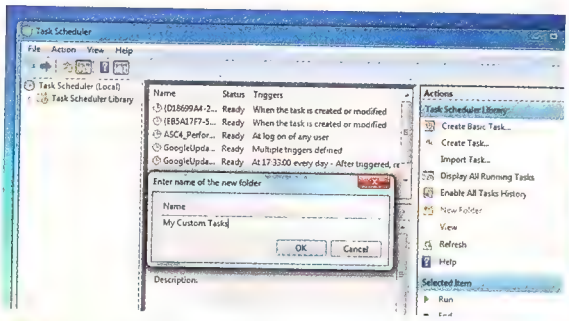
WINDOWS TASK SCHEDULER

Go to 'Start > Control Panel > System and Security > Administrative Tools' and then double-click the program.

Every day when I turn on my PC, I find myself firing up the same software and reading the same web sites. But instead of launching apps manually or typing in the URLs, Windows opens them up automatically. While I'm away from my computer, it sometimes performs routine maintenance by defragging the disk or scanning for viruses. The tool that turns your docile computer into a caring virtual nanny is the Windows Task Scheduler. All you have to do is make a list of tasks you'd like to automate and configure the Task Scheduler to handle them for you. Task Scheduler can launch any app that's installed and gives you extensive options to specify the time intervals when you want these tasks to run.

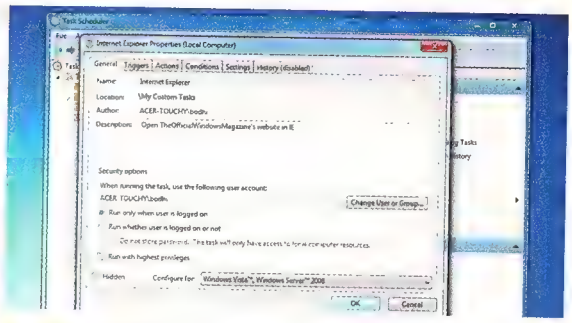
SET UP TASKS TO RUN AUTOMATICALLY

Configure Task Scheduler to carry out the maintenance jobs you might forget.



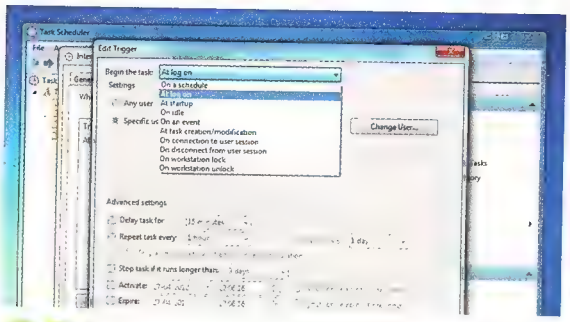
01 LAUNCH TASK SCHEDULER

The easiest way to get to the tool is by typing Task Scheduler into the 'Start' menu search. The main interface gives you an overview of the tool and lists all the active tasks. Before you create your own tasks, right-click the 'Task Scheduler' library and select the 'New folder' option to create a folder that will house all your custom tasks.



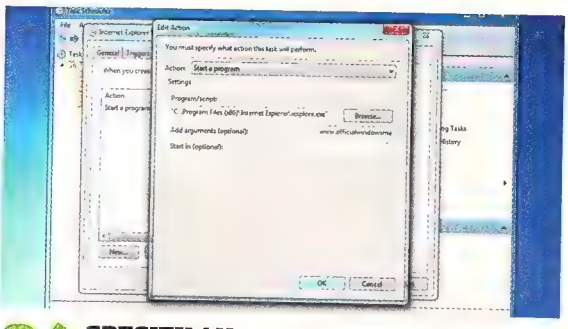
02 CREATE A TASK

Select the folder you've created and go to 'Action > Create Task'. This will open the 'Create Task' dialogue box, which helps you define the task. Start by entering the name of the task. While it's safe to continue with the default security options, which run the task as the current logged-in user, you also have the option to run the task as another user.



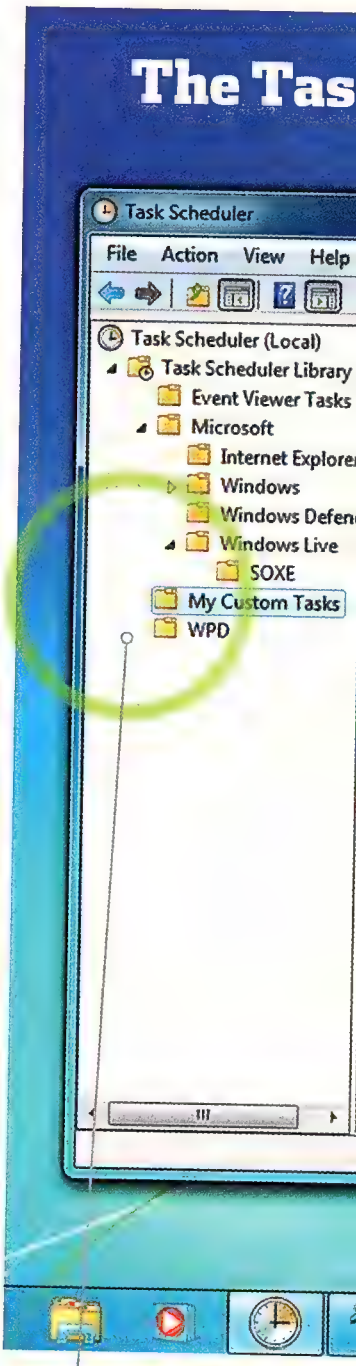
03 SET TRIGGERS

Now switch to the 'Triggers' tab and click the 'New' button to define the conditions that will trigger your chosen task. You can either start a task at a particular time of the day or during particular events, such as the computer booting up. For now, just select 'At log on' from the drop-down list, which will start the task when a user logs in.



04 SPECIFY AN ACTION

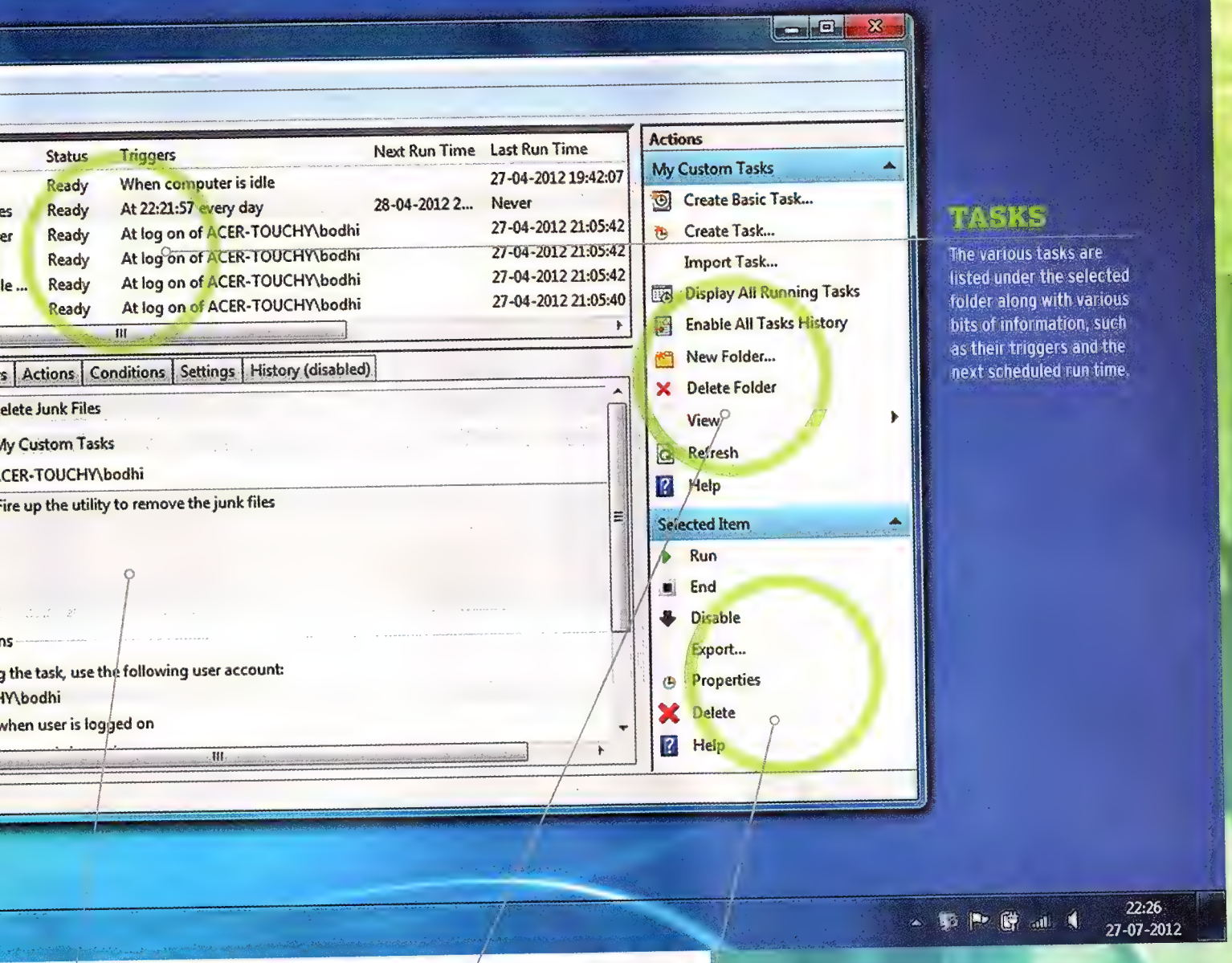
Head to the 'Actions' tab and click the 'New' button to define the action that will take place when the task is triggered. The tool can perform three types of action. For now, select 'Start a program' from the 'Action' drop-down list and point to an app (Internet Explorer, for example) in the space provided below, with the name of a web site in the optional 'Add arguments' box.



TASK LIBRARY

Lists all the defined tasks categorised by folders. The custom folder you create for housing all your tasks is also listed here.

Scheduler interface



TASKS

The various tasks are listed under the selected folder along with various bits of information, such as their triggers and the next scheduled run time.

UNIVERSAL ACTIONS

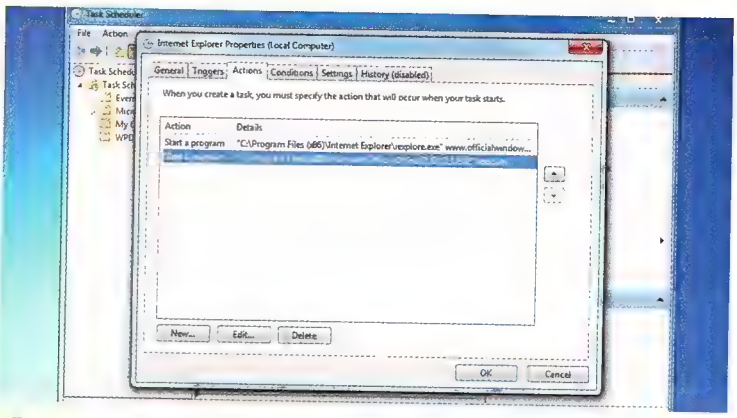
This column lists all the actions we can perform using the tool, such as creating a new folder or creating a new task.

TASK DETAILS

Displays all the settings of the selected task, such as the triggers, actions and other settings. To edit the settings, click on the 'Properties' link.

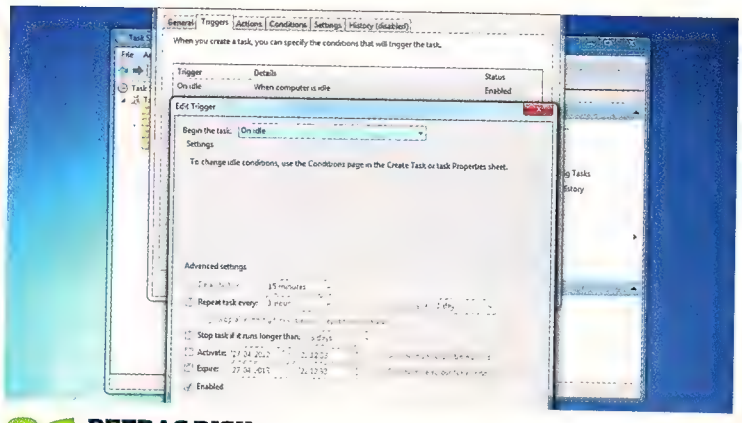
ACTIONS ON SELECTED ITEMS

This column lists the actions that can be performed on the currently selected task, such as running the task right away to check if it functions as expected.



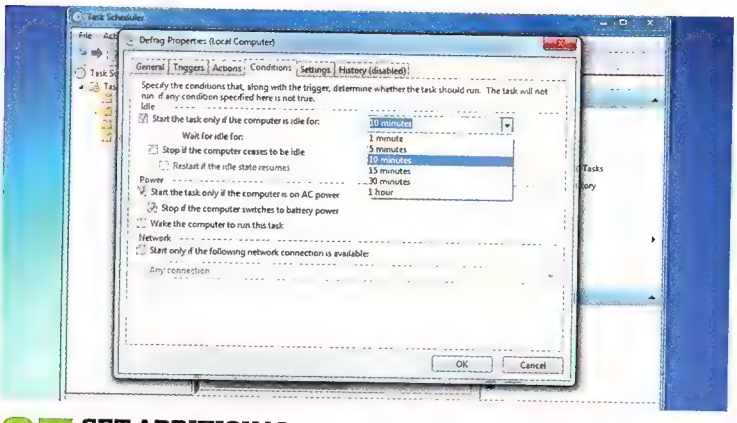
05 DIFFERENT ACTION, SAME TIME

You can also set multiple actions to occur at the same time. After adding the action in step 4, click the 'New' button again and ask the tool to launch another program that you want to run at startup. I set it to start Excel, along with my to-do list, by pointing to 'excel.exe' in the 'Settings' section, along with the name of the file in the 'Add arguments' box and its location in the 'Start in' box.



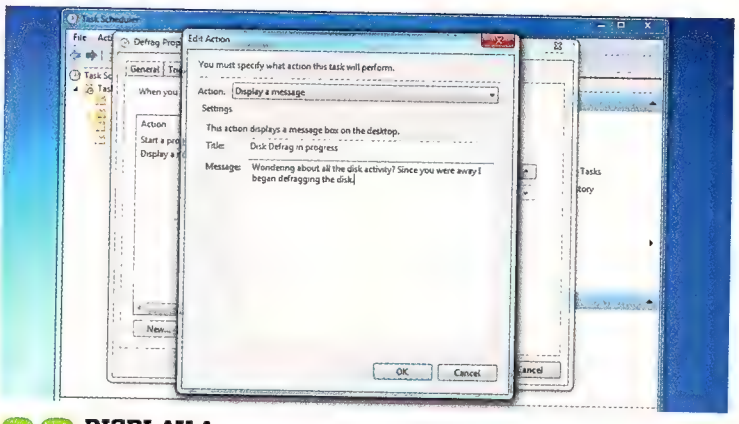
06 DEFRAG DISK WHEN IDLE

Now let's create a new task that will defrag the hard drive with the Windows Disk Defragmenter whenever our computer is idle. When creating this task, under the 'Action' tab, point to the app you want to launch (usually C:\Windows \System32\Defrag.exe). Then head over to the 'Trigger' tab and make sure you select the 'On idle' option when creating the trigger.



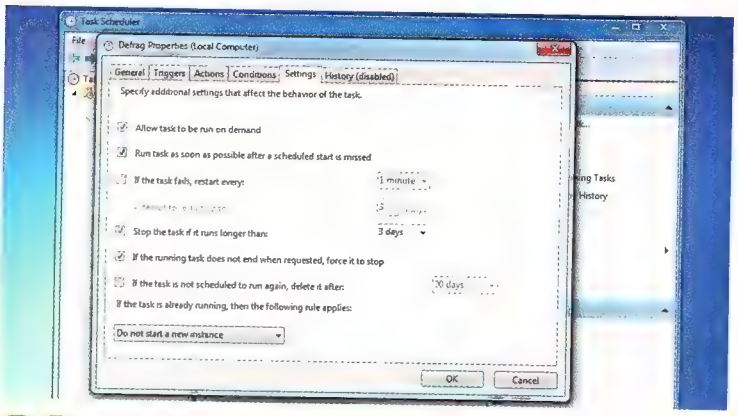
07 SET ADDITIONAL CONDITIONS

When you select the 'On idle' option, you have to define additional settings that alert the Task Scheduler when the computer is idle. To set the idle settings, head to the 'Conditions' tab and select one of the preset times from the drop-down list. For laptop users, there's also a checkbox that will ensure this task only runs when the computer is plugged in.



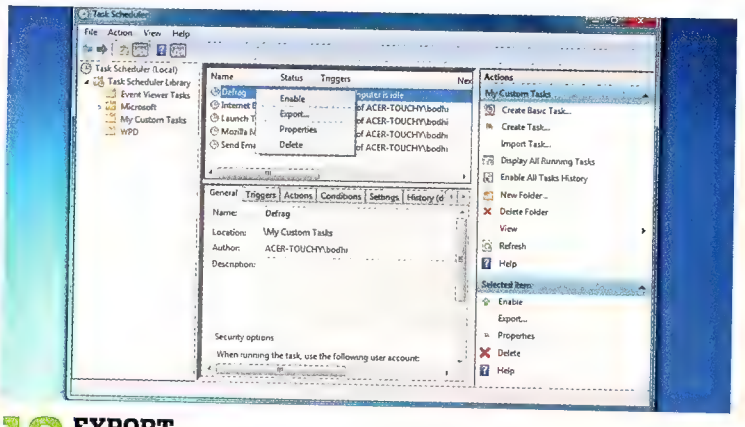
08 DISPLAY A MESSAGE

For any task that runs in the background, it's always helpful to create an action that displays a message to alert the user. For our defrag task, create a new action, but this time select the 'Display a message' option from the drop-down list and enter a message describing the event. I also use this feature to display messages reminding me to take care of chores during the day.



09 CONTROL TASK BEHAVIOUR

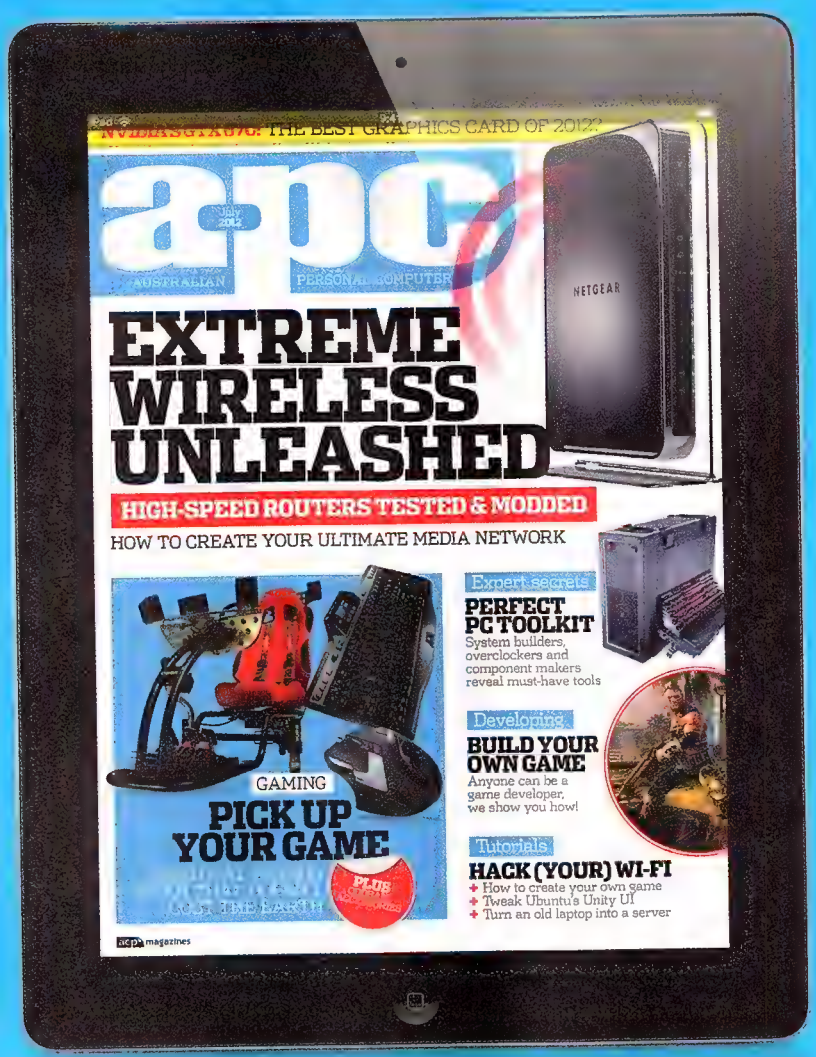
You can further tune the behaviour of a task from the 'Settings' tab. In most cases, the default settings should suffice, but some might require tweaking. For example, if you've set up a virus scan at a particular time and day, and your computer isn't switched on at that time, there's an option here that will run the task the next time the computer is on.



10 EXPORT THE TASK

It might sound like a challenge at first, but once you've set up Task Scheduler, it will improve your Windows experience considerably. I've just scratched the surface and shown you how I use it every day. If you have multiple computers with the same programs installed, you can right-click on a task to export it and then import it into a custom folder on another computer.

apc


apc
AUSTRALIAN PERSONAL COMPUTER
EXTREME WIRELESS UNLEASHED
HIGH-SPEED ROUTERS TESTED & MODDED
HOW TO CREATE YOUR ULTIMATE MEDIA NETWORK
NETGEAR
GAMING
PICK UP YOUR GAME
Expert secrets
PERFECT PC TOOLKIT
System builders, overclockers and component makers reveal must-have tools
Developing
BUILD YOUR OWN GAME
Anyone can be a game developer, we show you how!
Tutorials
HACK (YOUR) WI-FI
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HTML 5

PART 3

Forms in HTML5

Forms may not sound exciting, but HTML5 makes them so. Our new masterclass guru John Allsopp explains how to build cool HTML5 forms.

IN THIS SERIES

We put HTML5 to work with hands-on tutorials and templates. The rest of this 8-part series is written by expert John Allsopp.

APC EXPERT

JOHN ALLSOPP

With a background in computer science and mathematics – and a great deal of good fortune – John Allsopp's life collided with the web in the early '90s. For nearly 20 years he has developed software for web developers, built web sites and apps, and written books, countless articles and tutorials for print and online publications. In 2000, he wrote *A Dao of Web Design*, which continues to be widely cited as the theoretical foundation for Responsive Web Design.

Forms. The very word doesn't exactly fill anyone with excitement. So I've got a bit of an uphill battle on my hands with this, the third instalment in our series on HTML5. After all, Rajesh began the series by observing that HTML5 is 'hot'. So my challenge is to make forms hot with HTML5.

When you think about a form, you probably think of your tax statement or some other official documentation. And this is precisely what HTML forms were designed for (they've been around in HTML since 1993). When the web was essentially a static medium, forms allowed developers to build things like online shopping carts and allowed users to interact with governments, companies and one another in the browser without having to open an email client. Without forms there'd be no webmail, no comments in blogs – indeed, there'd be no modern web.

And forms, of course, are still useful for all these things. But the web is changing from a purely document-oriented medium to an application medium as well. The improvements in HTML5 forms are designed for building sophisticated application interfaces for web-based, tablet and mobile applications. Chances are you've used a 'native' iOS or Android app built with HTML5, using these features for its UI.

In this article and the next one in this series, we'll take a look at the user interface-focused features of HTML5, as well as features in CSS3 and CSS4 that go hand in hand with them. They'll allow us to create far less user-hostile web forms and slick mobile, tablet and browser-based application UIs.

GARBAGE IN, GARBAGE OUT

The heart of an HTML form is the `input` element. In HTML4, the types of input elements we have to work with are quite limited and include:

- `text` and `password` fields
- common controls like `checkboxes`, `radio` buttons, various types of button and `file` pickers

HTML5 adds to these significantly, with these new types of input elements, among others:

- `search` – for search fields
- `tel` – for telephone numbers
- `url` – for web addresses
- `email` – for email addresses
- various date and time types, including `date` and `time`
- `number` for numbers (integers like 4 and 7, and real numbers like 3.2)
- `range`, again for numbers, but this time presented to the user as a slider control
- And others, too, like `color` for selecting a colour, which are less commonly supported by modern browsers.

Let's take a look at some of the most widely supported and useful new input types and when, how and why you might use them (as well as any challenges there might be in using them right now).

BACKWARDS COMPATIBILITY

The first question you might ask is what happens if a type of field isn't supported in a browser? For example, what is displayed by Internet Explorer 6 for `<input type="number">`? In short, can we even use these input types yet?

Luckily, all browsers will display any input of a type they don't recognise as `type=text`. There are still a couple of issues you'll need to be aware of for specific types of input, particularly `date` and `time`, but we'll note those as we go. For the most part, we can use these new input types safe in the knowledge that where they aren't supported, the user can still use our interface.

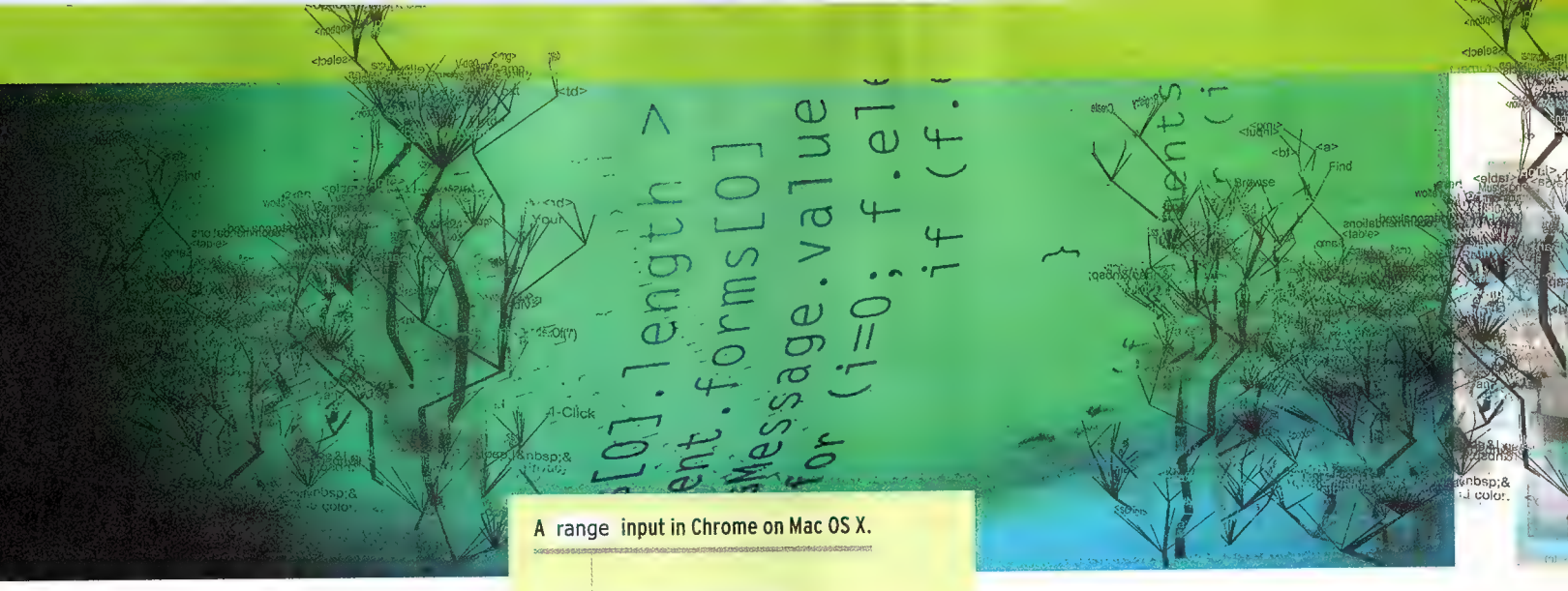
type=search

Different platforms have a standard appearance (and behaviour) for search fields in apps. Developers often attempt

The iOS virtual keyboard for inputs of type email.

The iOS virtual keyboard for inputs of type tel.

The iOS virtual keyboard for inputs of type url.



A range input in Chrome on Mac OS X.

A common slider plus number input control.

A range plus number input in Firefox.

A standard number input in desktop Safari.

to emulate these (in particular, the rounded rectangle appearance of search fields in Mac OS/iOS), which leads to incongruities and user irritation and confusion. In HTML5, we can simply specify that an input is of `type=search`, and let the browser worry about its appearance and behaviour (developers can still change the appearance of a search field using CSS, something we'll look at in a little more detail next time).

While support for search fields is relatively rudimentary at the moment, browsers typically only apply a distinct style to a search field; it's not hard to imagine browser developers making search fields increasingly more sophisticated (remembering and displaying past searches, for example). So, should you use the input `type=search` when you have search fields in a page or app? My rule of thumb with HTML5 features is if it does no harm, even if it currently adds little, then why not. So go ahead and use `type=search` where appropriate. As browsers improve support for search fields, your apps and forms will only get better, without any extra effort on your part.

tel, url, email

Almost any online form is likely to ask you for at least one of these means of contacting you, if not all three. With HTML4, all we have to work with is inputs of type text. But HTML5 comes to our aid with specific input types for specific types of information, including inputs of type `tel`, `url` and `email`. But just what good are these for us as developers and for our users?

Firstly, for our users, particularly on mobile devices, one of the benefits is the virtual keyboard presented to the user when the focus on these fields changes, depending on the input type. For example, how the user sees the keyboard for each type can be seen at the bottom of the opposite page. To me, that's worth the price of admission alone. But wait, there's more!

Validating that a user's input is correct is often really tricky. For example, checking whether an email address is valid is really hard. But with browsers that support input of `type=email` or `url` (though not `tel`, there's too much potential variation worldwide, which doesn't stop some sites from trying to insist on a certain, usually US domestic, format) the browser will check whether the user's input is valid.

As developers, we'll see in the next article how CSS4 allows us to style fields with invalid input without using JavaScript. Or with just a little bit of JavaScript, we can present the user with a specific message when their input isn't correct.

We'll look at another benefit for us as developers next time, too, where styling using the CSS3 attribute selector makes for cleaner HTML mark-up.

Applying my 'should I use it?' rule of thumb, is falling back to text field OK for browsers that don't support these input types? Yes, since users can simply type or paste into a text field. So once more, there's no harm in less capable browsers and plenty of benefits for our users and us as developers. So don't hold back! Feel free to use these today.

NUMERICAL DATA

As I mentioned briefly, there are two new types of input that allow users to input numerical data: `number` and `range`. These share most features in common and only differ in how the user actually inputs their information.

A `range` input, where supported, is presented to the user as a slider control. At left is an example of how Chrome displays a `range` element.

As a general rule, browsers will display the range as a native slider style control for the platform they're running on, making our UI look and feel more like a native experience. When range isn't supported, as we saw, the browser falls back to a text input, so the user will have to type or paste their input, and as a developer we won't be sure the input is a number. Note that you're most likely familiar with slider controls that feature both the slider itself and a number field (see image above).

However, HTML5 range elements feature only the slider part of the control. We can build our own control that has both a number input field and a range. As a developer, you'll have to keep the values synchronised using JavaScript and you'll also want to worry about what happens when `range` isn't supported, as your user will end up with something like the above Firefox example. That's Probably not what we want the user to experience!

A `number` input is typically displayed as a text field, with commonly (in desktop browsers) a 'spinbox' to its right, allowing the user to step up and down in increments. We can specify these increments or 'steps' (which are 1 by default) as we'll see in a second.

range & number attributes

We can specify a minimum valid value (such as 0, or -100), a maximum (10 or 100, for example), as well as a step value (we may want the user to input a number with at most one trailing decimal place, for instance). For these we use the `min`, `max` and `step` attributes respectively.

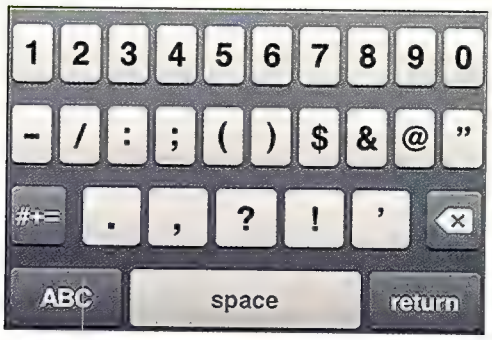
Here, we constrain the user's input to a value between 0 and 10, and with at most a 1 decimal place.

```
<input type=number min=0 max=10 step=0.1>
```

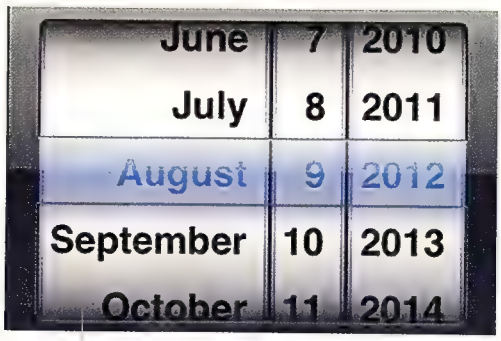
Note the `0` in front of the step value. For numbers less than 1, this is required otherwise the step value is treated as 1. You *will* make this mistake. You've been warned!

number versus range

So when would you use `range` and when would you use `number` inputs? Technically, the HTML5 specification says that a range input is for numerical input when 'the exact value is not important'. So it might be



iOS virtual keyboard for number inputs.



iOS date picker.

iOS time picker.

used for rating something – expressing satisfaction, rather than entering more precise details like an age. On the other hand, when we need to enter precise values, such as a price, someone's age and so on, **number** is the appropriate **input** type to use.

Here for instance, we might ask for a bid on an item in an auction using a **number** input:

```
<input type=number min=1 step=0.01>
```

We've specified a minimum bid of $1 and increments for bids of 1c.

Why use **number** and **range** inputs? Again, our users benefit, with it easier for them to input a value, whether on desktop, mobile or tablet devices. On iOS, Android and other mobile and tablet platforms, users get a modified virtual keyboard for entering numerical data.

As we saw, on most desktop browsers a spinbox associated with the input makes it easier to choose a value within the range we want from our user. For developers, the browser will validate the user's input, so we can style these fields differently depending on whether their value is valid or not, using CSS (again, we'll cover this in the next article in this series).

For the most part, **range** and **number** are safe to use regardless of the browser because they'll both fall back to text inputs, which will be fine in most cases.

Curiously, while number and range are widely supported on desktop and mobile browsers, Firefox on the desktop supports neither, showing both as simply text fields.

DATE & TIME

Almost no-one escapes the need to input a date into a web form, particularly when booking travel and accommodation. And I bet like me, you've on more than one occasion cursed some custom-built date picker, particularly when you're using a mobile device. HTML5 again comes to the rescue, with built-in input types for choosing dates, times and various combinations of date or time.

type=date

date inputs on mobile and tablet devices present the user with a familiar date picker, making it easy for them to quickly input the desired value, such on iOS, as you can see in the images above.

Similarly an input of type **time** allows users to quickly input a time value (see above).

As with **url**, **email** and **number** inputs, browsers will validate automatically **date** and **time** input. On mobile devices this isn't much of a concern, as the only way a user has to input a value is using the date or time picker.

A word of warning

While **date** and **time** input types are well supported on mobile and tablet devices, they're less so in desktop browsers. Chrome and Opera present the user with a date picker, which is functional, but to tell the truth, quite ugly, and which can't be easily styled with CSS.

Safari presents the user with an even simpler input field, where the user can type the date in the format day/month/year, along with a spinbox to step up and down by day. This is hardly the most user-friendly input type.

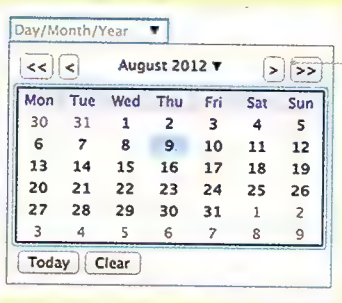
So while **date** input types provide significant benefits on mobile and tablet, they're little better than a text field on the desktop. In fact, it could be argued that they're worse. Because the user can type dates or values in these fields in desktop browsers, ensuring that the value they've input is valid is a bit more work. Rather than presenting users on the desktop with a single input field, we might present them with three **select** elements: one each for day, month and year (or similarly, for time: two select elements, one each for hour and minute). Or perhaps we might use a custom date picker control, of which there are many available online.

OTHER ELEMENTS

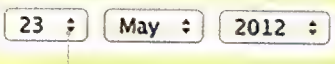
In addition to these new input types, HTML5 provides a number of new elements to be used in forms. These include:

- **output**. This element is used for displaying calculated values, such as the total in a shopping cart.
- **progress**. This is used to display how far along a task is, such as uploading a file.
- **meter**. A meter is for displaying how much of a resource (such as disk space) is being used – the rating of something on a scale (for example, 3 stars out of 5) and similar values within a range. It's like the input of type **range**, but for output values.

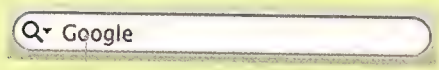
These are less likely to be commonly used and as yet, aren't widely



Chrome date picker.

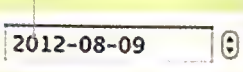


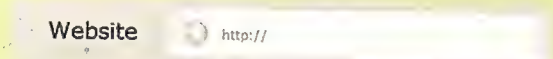
Inputting dates with **select** elements.



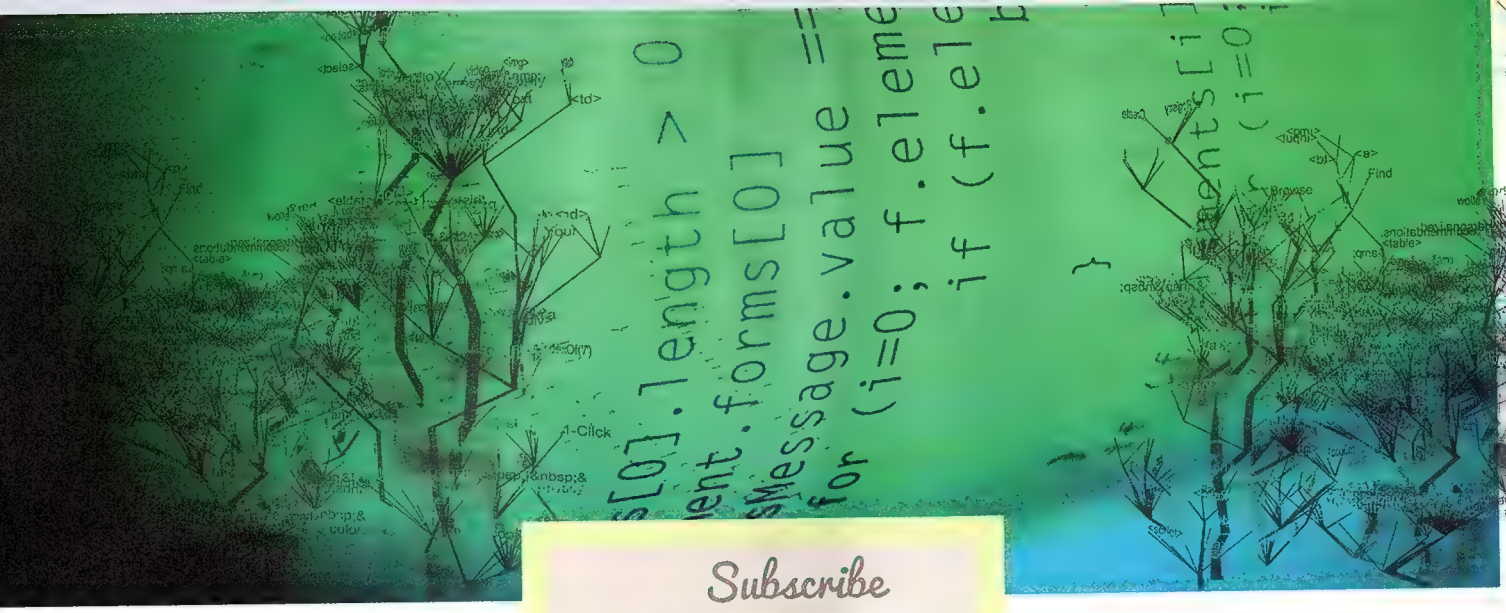
Placeholder **text in a browser's search field.**

Safari Desktop date picker.





Placeholder **text in an input element.**



supported in browsers. While it's worth knowing that they exist, it's unlikely you'll be using them just yet.

ATTRIBUTES

HTML5's new UI features don't stop with just new input types and some new elements. There are also several new attributes to help us improve the user experience.

placeholder

You've probably seen forms where the intent of an input element appears inside the element, usually in grey text.

Until HTML5, this required using JavaScript, but with HTML5 it's as simple as using a new attribute for the element `placeholder`. The value of the placeholder attribute is the text we want displayed in the `input` element:

```
<input type=number placeholder="what's your age?">
```

As soon as the user starts entering content in the field, the placeholder text is replaced by that content. The attribute `placeholder` is backwards compatible, so where it's not supported, users are none the wiser. For that reason, it's important to not use it in place of a label or for vital information, but it can otherwise be safely used right now.

autofocus

When a page with some type of form or input first loads in a browser, we'll most likely want our users to fill in the form, so let's make it as easy as possible for them. Cutting out redundant steps, such as forcing our users to click, tap, tab or otherwise focus on an input element before they start filling in a form means they're more likely to start doing so, and more likely to keep going. In the past, we might have used JavaScript to focus the user's input automatically on a field. In HTML5, we simply use the `autofocus` attribute. Just add the word `autofocus` to the tag of the `input` element we want to have the focus when the page loads.

```
input type="text" autofocus
```

You might only have ever seen attributes with values (for example, `placeholder="what's your age?"`). But a special kind of attribute, called Boolean attributes doesn't require a value. Rather, if the attribute is present, its value is `true`. If it's absent, the value is false. One of these Boolean attributes is `autofocus`.

autocomplete

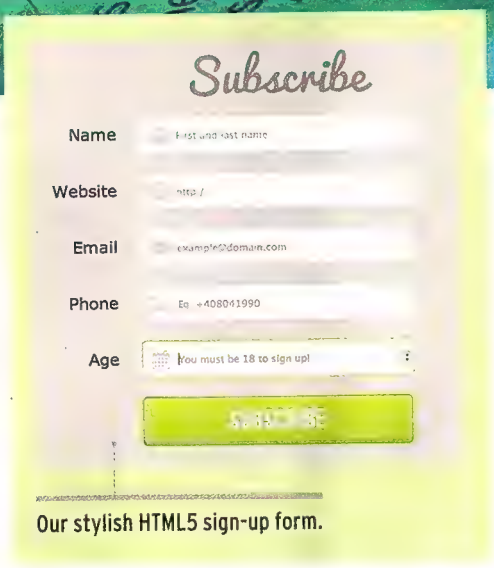
When filling in forms, particularly on mobile, small things can irritate our users, making them leave a site never to return. On a mobile device, I'm sure you've found form fields that attempt to autocomplete or correct your name, email address or other details. And like me, it probably infuriates you.

Autocorrect is great when it's done right. But for some kinds of input, we probably don't want the browser to 'help' our users. Once again, HTML5 has got us covered with the `autocomplete` attribute. Unlike `autofocus`, `autocomplete` isn't a Boolean attribute because by default, autocomplete is typically on for inputs of type text, though typically not for other input types such as `tel`, `url` and `number`. To turn on autocomplete, we use `autocomplete="on"` and to turn it off, use `autocomplete="off"`.

There's a minor complication with iOS. Safari on iOS devices doesn't support the attribute `autocomplete`, but does support `autocorrect` (with values of `on` and `off`).

So, to summarise, by default, text fields will typically be autocorrected by the browser on mobile devices. Other input types generally won't be.

Turn off autocomplete by using `autocorrect="off"` and `autocomplete="off"` (this is a belts and braces approach to cover iOS and other devices). Likewise, enable autocomplete (for inputs of type `text`, but usually not other input types, that is) using `autocorrect="on"` and `autocomplete="on"`.



Our stylish HTML5 sign-up form.

BRINGING IT ALL TOGETHER

In this month's template we've created a sign-up form with a bit of style, once again from our design gurus Neon Three. What HTML5 features might we have used? At a glance, think of which of the new input types and attributes were used for each input. Let's take a look at one of the fields.

```
<label for=age>Age</label>

<input id=age name=age type=number placeholder="You must be 18 to sign up!" required min=18>
```

We've used an `input` of type `number` and have a `min` required value of 18. There's some `placeholder` text (interestingly, Safari on the Mac doesn't show placeholder text on `number` input types, but Chrome does). We've even made it a required field in our form – just what's going on here will have to wait for the next instalment in the series, where we look at how to validate a user's input without using JavaScript, and how to style our forms with CSS3 and even CSS4.

ACCESSIBILITY & LABELS

For accessible forms, we want to associate each of our `input` elements with a `label`. Screen reader software will then be able to read the text of the label for their users, making it much easier for them to use the form.

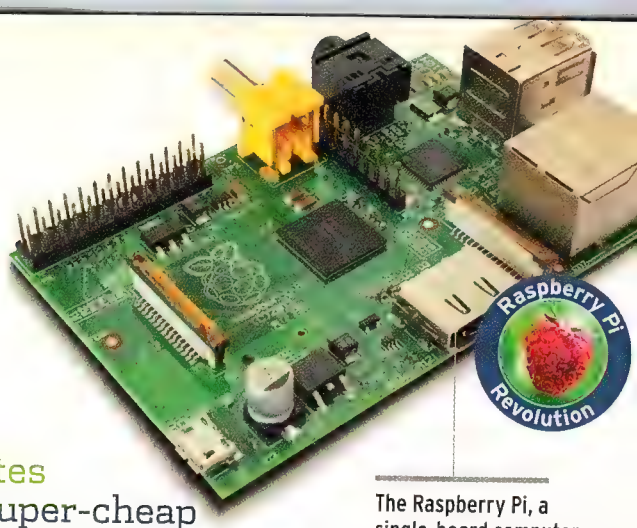
In the example above, you'll see we have a `label` with a `for` attribute, the value of this attribute is the `id` of the input element this label is for. This gives us the additional benefit that when the user clicks or taps the label, the browser will focus on the input field associated with it.

See you next time, where we'll look at validating forms with no JavaScript required, and style our forms using CSS3 and CSS4.

RASPBERRY PI

Single-board computers

Super-cheap computing has arrived. Darren Yates shows you how to do real computing with the super-cheap Raspberry Pi and Rikomagic MK802 single-board computers.



The Raspberry Pi, a single-board computer for just $38 plus shipping.

APC EXPERT

DARREN YATES

Darren reckons he's reviewed around 2000 computers since 1995, but even he's not seen computers this cheap since the mid-'80s.

Before we begin, thanks to those readers who emailed or called up about our massive single-board computers (SBCs) feature last month. It received a terrific response and clearly struck a chord with many of you. No doubt a good number of you have lined up to grab one of these budget marvels, whether it's the Raspberry Pi or one of the Android computer-in-a-stick devices from eBay.

MARKET CHANGES

Rikomagic's MK802, the first USB computer stick under $50 on eBay.

It's well worth keeping an eye on the market because it's gathered pace noticeably since last month's story and it could change your mind on a Raspberry Pi. Chinese manufacturers are churning out ARM-based USB stick computers by the truckload and prices have now fallen below the magic $50 (including shipping) barrier.

Despite the MK802's lack of electrostatic discharge (ESD) and voltage regulation, its popularity has been boosted by its newfound ability to run Ubuntu Linux.

This super-cheap version of the MK802 features a 1GHz Allwinner A10 ARMv7 processor, 512MB of RAM, 4GB of flash storage, a USB OTG port and HDMI output.

However, it has competition at the same $49 price now in the new Android TV Cloud Stick, which runs a 1GHz Telechips TCC8925 ARMv7 processor instead. Both have Android 4.0 ready to go.

Having read through the TCC8925 data sheet, it's an impressive chip capable of far more than you'll see in these sticks – S/PDIF digital audio, 7.1-channel I2S audio path, four-channel video input, Gigabit Ethernet, eight-channel/12-bit analogue-to-digital converter and on it goes.

The reality is the Raspberry Pi will soon be overtaken as China's SBC Momentum gathers steam, but these devices have totally different goals. The Pi was designed as an educational computer for kids, while USB computer sticks are simply the commercial reality of falling technology prices and innovative design.

Rikomagic isn't wasting time either – the MK802 II, which includes voltage regulation and ESD protection, is now available on eBay for $65, including shipping.

MORE TRICKS

Since we published our story last month, we've had more time with the Raspberry Pi and MK802 to learn their quirks and find some of their hidden treasures. As one reader put it, the Raspberry Pi is obviously no Core i7, but it's a decent low-cost computer.

So this month, we'll show you how to run Windows remotely on your Raspberry Pi, how to non-destructively run Ubuntu on your MK802 and keep Android 4.0, and how to overclock your Raspberry Pi.

GETTING MORE SPEED

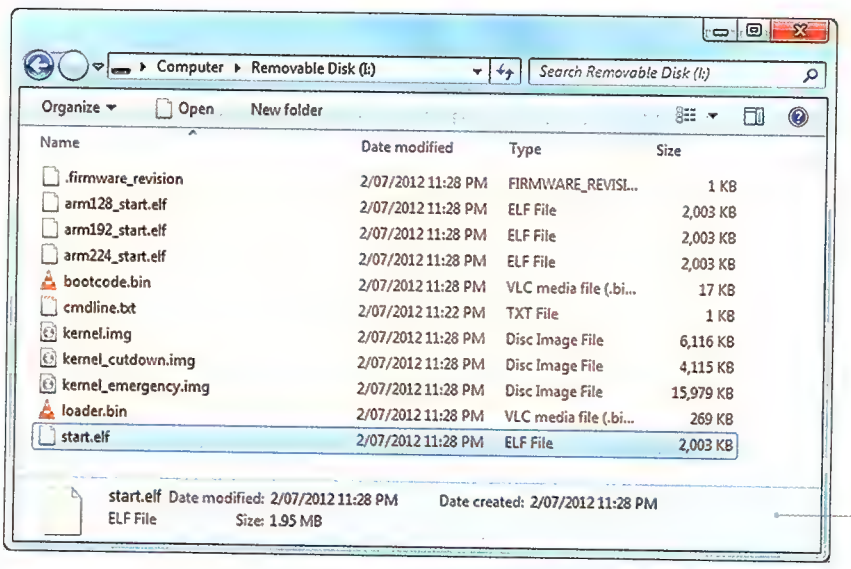
We'll talk about overclocking shortly, but here's a way to boost performance without resorting to clock speed tweaks. Our APC piLinux operating system pushes the Raspberry Pi pretty close to its performance end stops by using the Xfce desktop environment.

If you're not planning to watch video or play games, one way to eke out a little extra speed is to change the CPU/GPU memory split from the default 192/64MB to 224/32MB. This gives APC piLinux a little more breathing space by giving it another 32MB of RAM. Another way is to use at least a Class 6 SD card rather than a cheaper Class 4 type – think of it as the Pi equivalent of running an SSD!

TRY THE RASPBIAN OS

The Raspbian team has spent the last few months recompiling the huge Debian ARMv6 library into one with hardware floating point (HFP) support and the resulting performance gains are said to be impressive – depending on the app, reports are 60% or more extra speed is available.

Still, based on some rough testing we did this month, our own APC piLinux is no slouch either. Either way, if you want to see just how fast the Pi can go, give it a good operating system and a dash of overclocking. You can grab Raspbian from **www.raspberrypi.org/downloads** and APC piLinux from **apcmag.com/pilinux.htm**.


Computer ▸ Removable Disk (I:)
Search Removable Disk (I:)
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arm224_start.elf 2/07/2012 11:28 PM ELF File 2,003 KB
bootcode.bin 2/07/2012 11:28 PM VLC media file (.bi... 17 KB
cmdline.txt 2/07/2012 11:22 PM TXT File 1 KB
kernel.img 2/07/2012 11:28 PM Disc Image File 6,116 KB
kernel_cutdown.img 2/07/2012 11:28 PM Disc Image File 4,115 KB
kernel_emergency.img 2/07/2012 11:28 PM Disc Image File 15,979 KB
loader.bin 2/07/2012 11:28 PM VLC media file (.bi... 269 KB
start.elf 2/07/2012 11:28 PM ELF File 2,003 KB
start.elf Date modified: 2/07/2012 11:28 PM Date created: 2/07/2012 11:28 PM
ELF File Size: 1.95 MB

Swap the 'start.elf' file to change the Pi's memory allocation.

Overclocking your Raspberry Pi

Crank up the performance on your Raspberry Pi. Darren Yates shows you the safe way to get more speed.

Broadcom's BCM2835 media application processor is a complete system on a chip (SoC), but despite only having 256MB of memory on board, it's probably a little underdone by its stock 700MHz clock speed. However, you can overclock the Raspberry Pi in a relatively simple way.

TWO OPTIONS

As with standard PC overclocking, you have two options: you can crank up the CPU clock until it no longer boots up and drop back a notch or two to get the best performance, or you can do that plus up the CPU voltage.

On the Pi, the former will get you up to as high as 930MHz, depending on your chip. Doing the latter can notch up 1GHz, but will definitely void your warranty.

The BCM2835 has a CPU register that's permanently set if the core voltage is tampered with. There are no such issues when simply upping the clock speed itself.

Like all overclocking there are no guarantees, but hitting 900MHz is reasonably common and that's a better than 25% increase, which is nothing to sneeze at.

THE SAFE OPTION

While the Pi obviously doesn't have a normal BIOS, it does have a text-based one that you can use to set various aspects of the system at boot time. All you need to do is create a 'config.txt' file in the root of the 64MB boot partition of the Pi's boot SD card.

Because it uses this boot partition, you can write the file on a Windows PC. However, if you do it in Windows, you must use Notepad++ (**www.notepad-plus-plus.org**) and set it to create Unix-format files.

SIMPLE BENCHTEST

You can do simple 'before' and 'after' performance testing on your Raspberry Pi by running this little script to calculate Pi to 3,000 decimal places:

```
time echo "scale=3000;4*a(1)" | bc -l
```

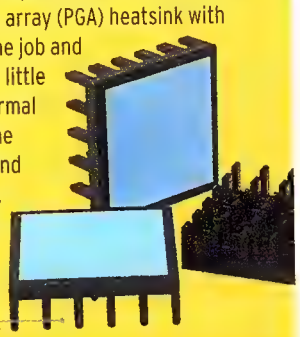
If it doesn't work, you may need to install Binary Calculator. Install it on your internet-connected Pi by running:

```
sudo apt-get install bc
```

Now you can enjoy your Pi with even more crunch for your dollar!

HEATSINKING THE PI CPU

At the standard 700MHz clock rate, the BCM2835 CPU doesn't get hot enough to warrant heatsinking – even when on a 100% loading, the chip reportedly on tops out at 65°C. But as you increase the clock rate, you also ramp up the heat. So if you're going to overclock, out tip is to provide the CPU with some heatsinking. Jaycar Electronics sells a pin-grid array (PGA) heatsink with adhesive thermal paste (HH-8580) that does the job and in keeping with the Pi, it only costs $3.25. It's a little oversized, but all you need to do is cut the thermal pad to the CPU size with a box knife, peel off the remaining backing tape, centre it on the CPU and gently yet firmly press the heatsink into place. Its 5.9°C/W thermal resistance will easily keep the CPU well cooled.



This tiny $3 PGA heatsink will keep your overclocked Pi's CPU cool.

To do that, launch Notepad++, select 'Settings > Preferences > New Document/default directory' and check the 'Unix' button under 'Format'.

THE SIMPLE OPTION

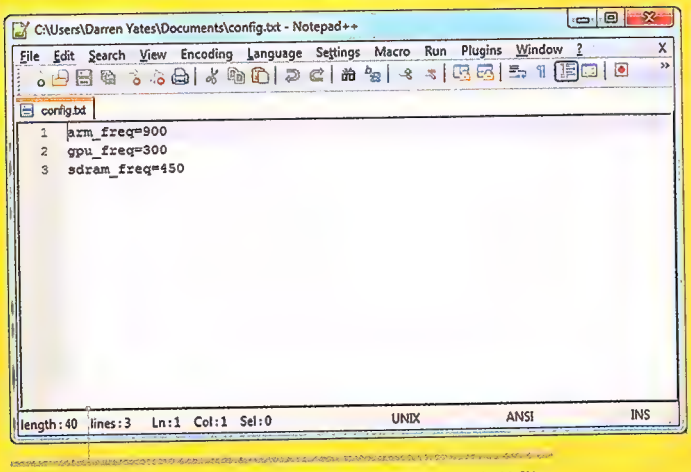
There are numerous clock settings you can use, but the simplest option is to just stick with the processor (arm_freq), the GPU (gpu_freq) and the system memory (sdram_freq) clocks. In your 'config.txt' file, enter the following:

```
carm_freq=800

gpu_freq=300

sdram_freq=450
```

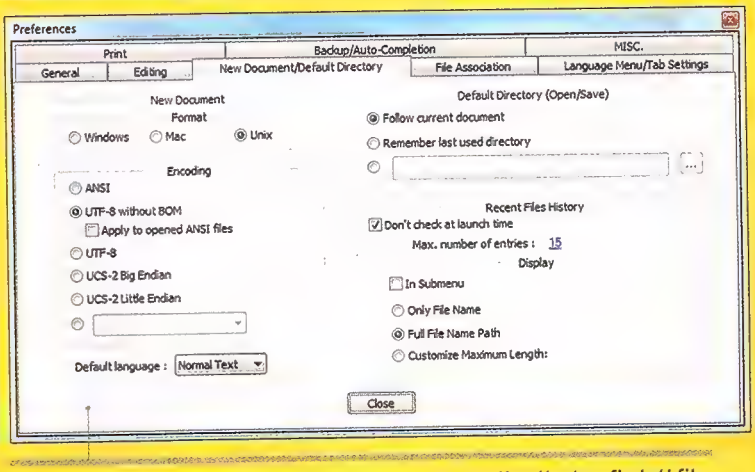
Save the file to your boot SD card's root folder, load it into your Raspberry Pi and boot. Almost all Pi boards have no trouble hitting 800MHz, but feel free to try for higher.

If the Pi fails to boot, load the card back into Windows, drop those values down a bit and try again.

If you want to push the Pi harder, try 900/250/500 for the arm/gpu/sdram settings in the 'config.txt' file. This worked for us.


C:\Users\Darren Yates\Documents\config.txt - Notepad++
File Edit Search View Encoding Language Settings Macro Run Plugins Window ?
config.txt
1 arm_freq=900
2 gpu_freq=300
3 sdram_freq=450
length : 40 lines : 3 Ln : 1 Col : 1 Sel : 0
UNIX
ANSI
INS

Notepad++ is the best tool to create the Pi's 'config.txt' file.



Set Notepad++ to create Unix-format files before creating the 'config.txt' file.

The Rikomagic MK802, a USB stick computer for under $50.

HOT TIP:
WATCH THE MICROSD CARD SLOT

The MK802's microSD card slot isn't the best, it has to be said. The actual card slot is quite deeply recessed inside the outer plastic shell and once the card is in, it's actually hard to get out. We had to use long-nose pliers. Just make sure the card goes in the slot and not just into the shell cavity.

Running Ubuntu on the MK802

Want something more desktop-like than Android on your MK802? How does Ubuntu sound? Darren Yates shows you how.

Rikomagic's MK802 isn't perfect when it comes to electronic design, lacking ESD protection and CPU voltage regulation. However, even with just moderate care, it's turning out to be a very popular computer-on-a-USB-stick device, especially now that it's available for under $50 on eBay. While its Android 4.0 operating system gives you plenty of options, it's not a true desktop OS, but it turns out the MK802 runs like the Raspberry Pi: you can boot it up externally from a microSD card. What's more, you don't lose Android 4.0 – just shut down, remove the card, reboot and you're back to the little green robot.

INSTALLING UBUNTU

The method of external OS installation on the MK802 is very similar to a Raspberry Pi: it requires a dual-partitioned 4GB minimum microSD card. The first partition is a small 16MB FAT32 boot area while the second block holds the OS proper.

Windows can't handle dual partitions on removable devices, although it will write a dual-partition image to the card using the free Win32DiskImager app.

There are also different OS versions depending on your MK802's system RAM (512MB or 1GB) and your desired output (720p or 1080p). The reason for the separate output options is said to be based on performance, with the MK802 understandably doing better at 720p than 1080p. You'll find the options at **tinyurl.com/cosycfz**.

We tested the 1GB/720p Lubuntu 12.04 distro and it's little sluggish, as you'd expect with a 1GHz single-core ARM processor. But this 300MB distro has plenty of apps including AbiWord (word processing), Gnumeric (spreadsheet) and Chromium (web browser). Wi-Fi drivers are ready to go, so create a new connection for your network using the Wi-Fi notification box in the system tray and it will work straight away.

BENCHMARK TESTS

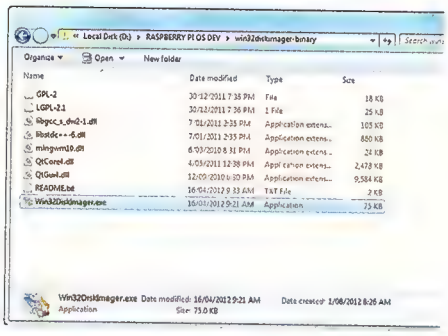
We ran the simple benchtest on the Raspberry Pi with both Raspbian and APC piLinux at both 700 and 900MHz. We also ran the same test on the MK802 with the Lubuntu 1GB/720p distro. Here's what happened.

Raspberry Pi (700MHz): Raspbian	82.13sec
Raspberry Pi (900MHz): Raspbian	60.76sec
Raspberry Pi (700MHz): APC piLinux	70.72sec
Raspberry Pi (900MHz): APC piLinux	56.06sec

Lubuntu 12.04's Chromium browser running on a Rikomagic MK802.

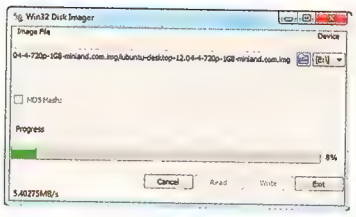
INSTALLING UBUNTU 12.04 ONTO YOUR MK802

01 Download an Ubuntu distro to suit your MK802's system RAM and your desired screen resolution from **tinyurl.com/cosycfz** (we recommend the 720p Lubuntu 12.04 distro). Also grab the Win32DiskImager app from **tinyurl.com/7ll9vau**. Unzip the files to your hard drive.

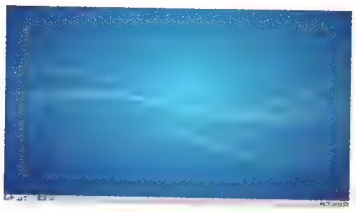


02 Grab a 4GB microSD card (preferably Class 6), load it into your card reader and plug it into your Windows PC. Launch Win32DiskImager.

03 Locate the distro's .IMG image file from the unzipped archive, ensure you select the correct drive letter for your microSD card and when you're ready, click the 'Write' button. The OS will take about a minute to write to the card.



04 When the write is complete, make sure your MK802 is powered off and plug in the card. Boot up and after about 30-40 seconds, you should see the Lubuntu desktop screen. When you're asked to log in, the password is **miniand** . If you're using a USB keyboard and mouse plugged into a powered hub, the MK802 should work straight away. To go back to Android 4.0, shut down and unplug the MK802, remove the microSD card and reboot.



Turn your Pi into a Windows thin client

Running Windows on a Raspberry Pi? Not quite, but Darren Yates shows how to turn the Pi into a Windows thin client.

While Microsoft is making its Windows operating system available on ARM architecture for the first time, even we think it's ambitious to try and get it running on a Raspberry Pi. Actually, it's impossible because even if we could get hold of it, it won't support the ARMv6 architecture of the Pi's BCM2835 CPU.

However, there's a sneaky way we can make it look as though you're running Windows on the Pi and that's to turn it into a Windows thin client. Thin client support was huge about 10 years ago and basically, they're not much more than dumb terminals with only just enough processing power to operate a keyboard, mouse and monitor, and display data from a server.

The difference here is that your Windows PC will become the server and we'll access it from the Raspberry Pi using remote desktop software. Best of all, it's done using free software.

REMOTE DESKTOP

Remote desktop apps allow you control one PC from another over a network. These days it's used in many helpdesk situations where users get stuck, but don't have help physically on hand.

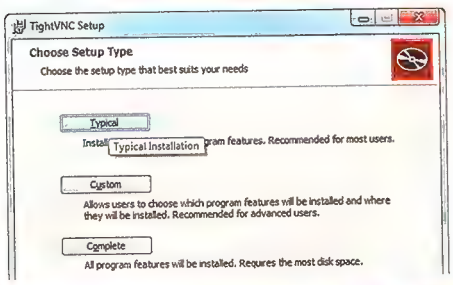
Running a remote desktop server on your Windows computer along with a remote desktop client on the Pi will allow us to at least look like we're running Windows on the Pi. In fact, you might find the Pi more responsive running apps on your Windows PC than running them itself. That's because of the dumb terminal effect: we're just using the Pi to run the screen, keyboard and mouse while the Windows PC does the actual real work.

We tested setup this with our exclusive APC piLinux and it worked a treat. Just don't expect to use this to watch videos. Video never works over remote desktop because it's just not fast enough and wasn't ever designed for it.

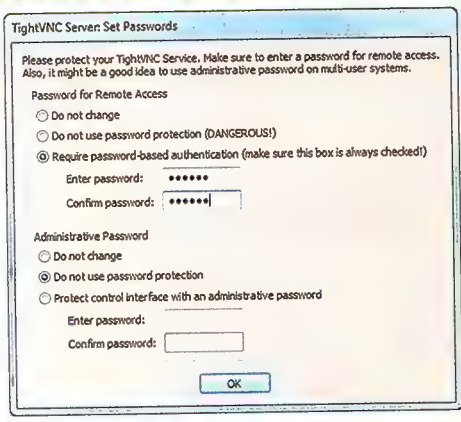
You should also be able to get this working using any Debian-based Linux distro, provided you can get the Remmina remote desktop app installed onto it. Remmina is actually a very decent remote desktop client and although we don't have the space here to cover all of its features, you'll be able to find more information about it at **remmina.sourceforge.net**.

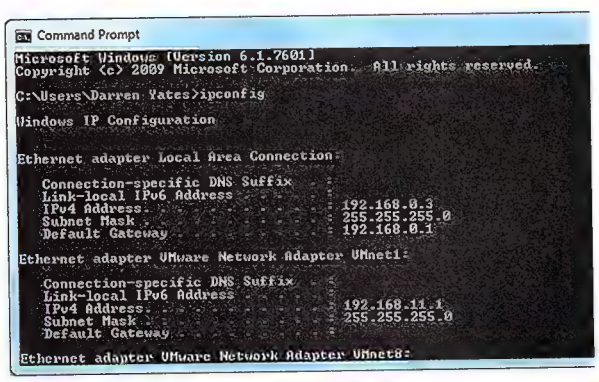
RUN WINDOWS REMOTELY ON YOUR RASPBERRY PI WITH APC PILINUX

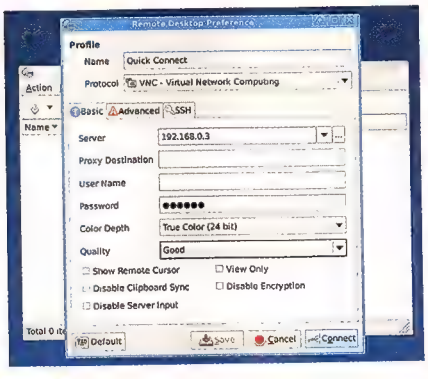
01 Grab TightVNC for Windows from **tightvnc.com**. Run the installer, click the 'Typical' button for installation type and follow the prompts.

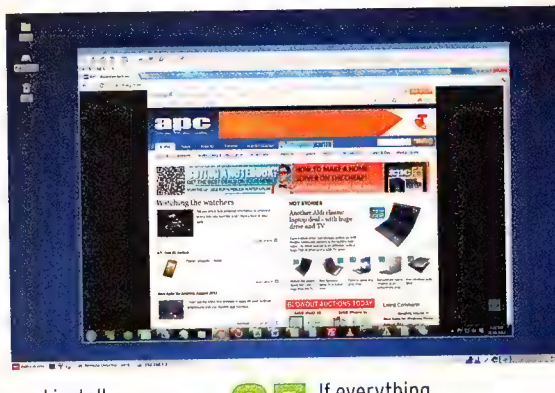

TightVNC Setup
Choose Setup Type
Choose the setup type that best suits your needs
Typical
Typical Installation
Custom
Allows users to choose which program features will be installed and where they will be installed. Recommended for advanced users.
Complete
All program features will be installed. Requires the most disk space.

02 When you get to the 'Set Passwords' window at the end, create a password under 'Password for Remote Access' that you want to use on your Raspberry Pi to gain access. When you're done, click 'OK'.


TightVNC Server: Set Passwords
Please protect your TightVNC Service. Make sure to enter a password for remote access. Also, it might be a good idea to use administrative password on multi-user systems.
Password for Remote Access
Do not change
Do not use password protection (DANGEROUS!)
Require password-based authentication (make sure this box is always checked!)
Enter password:
Confirm password:
Administrative Password
Do not change
Do not use password protection
Protect control interface with an administrative password
Enter password:
Confirm password:
OK


Command Prompt
Microsoft Windows [Version 6.1.7601]
Copyright (c) 2009 Microsoft Corporation. All rights reserved.
C:\Users\Darren Yates>ipconfig
Windows IP Configuration
Ethernet adapter Local Area Connection:
Connection-specific DNS Suffix .
Link-local IPv6 Address . . . . .
IPv4 Address. . . . . : 192.168.0.3
Subnet Mask . . . . . : 255.255.255.0
Default Gateway . . . . . : 192.168.0.1
Ethernet adapter VMware Network Adapter VMnet1:
Connection-specific DNS Suffix .
Link-local IPv6 Address . . . . .
IPv4 Address. . . . . : 192.168.11.1
Subnet Mask . . . . . : 255.255.255.0
Default Gateway . . . . . :
Ethernet adapter VMware Network Adapter VMnet8:





03 Launch a command prompt, type **ipconfig** and look for the IPv4 address of your Windows computer. It should be something like 192.168.0.3. Write it down.

04 Fire up your Pi, launch a terminal session and install Remmina (**sudo apt-get install remmina**). Assuming you're using APC piLinux, select 'Applications > Networks > Remmina'. Once the app is up, select 'Action > Quick Connect To > VNC – Virtual Network Computing'. On the 'Remote Desktop Preference' screen, type the Windows PC's IP address in the 'Server' entry, your password from step 2 in the 'Password' field, and change the 'Colour Depth' to 'True Color' and the 'Quality' to 'Good'. Click 'Connect'.

05 If everything goes right, you should now see your Windows PC desktop on the screen. Try opening apps or editing files – if that works, you're done.

PART 3

Mastering sound — rip DVD & CD audio & play it anywhere

Mike Le Voi gives you all the tools you need for ripping DVD and CD audio files, and explains how to convert them to play on your PC, smartphone or iPad.

IN THIS SERIES

This masterclass covers everything you need to know about editing and manipulating sound for music production, video and listening enjoyment.

APC EXPERT

MIKE LE VOI

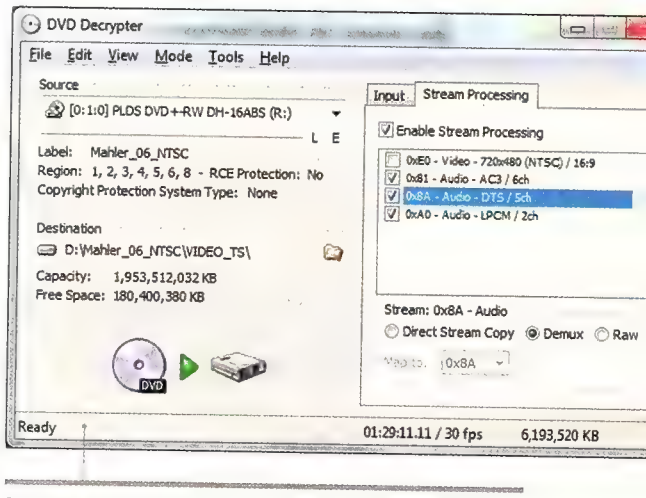
Mike is a PC enthusiast who cut his teeth with DOS and assembler programming in the 1990s. He's interested in all aspects of sound and video and is an active member of Brisbane's 4MBS radio concert recording team. He regularly takes multiple laptops and handheld recording devices to major classical music concerts. As a life-long audio nut, he specialises in high-quality audio production. He started with tape recording in the 1970s and has progressed through to current high-end digital recording. One of these days he may even get rid of his LP collection!

Ripping audio CD is easy using such programs as EAC or dBpoweramp and has been covered previously in *APC* and on our web site at **tinyurl.com/c6828kh**. Basically, a CD is ripped into PCM WAV format and the audio is extracted as individual tracks or as a CD image.

Ripping sound from DVD-Video isn't quite as easy. DVD music videos normally have a stereo 48KHz, 16-bit PCM soundtrack. DVD-Video discs also have surround sound audio in the lossy formats, AC-3 and/or DTS. Typically, AC-3 is 16-bit, six channels with a bit rate of 448Kbps. DTS is better quality and usually 16-bit, six channels with a bit rate of 755Kbps. You normally only rip the surround sound tracks if you want to play them back on your PC.

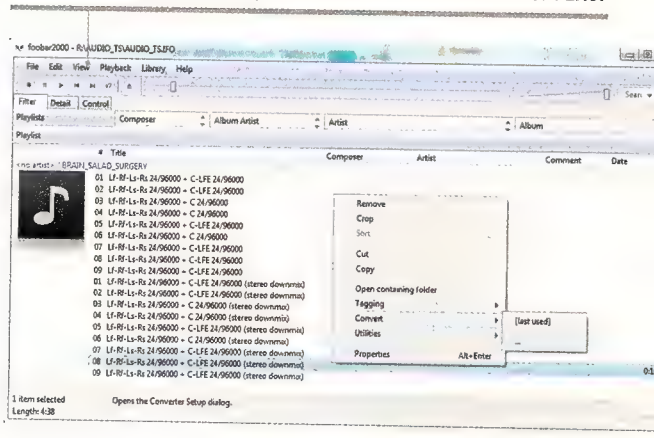
For DVD-Video discs, you can use DVD Decrypter. To rip the audio soundtracks from an unencrypted DVD for private use, first set the option 'Mode > IFO'. Insert your music DVD and choose 'Stream Processing'. Next, select the audio tracks you want and check the 'Demux' option for each soundtrack.

DVD-Audio discs normally have audio stored in MLP format. MLP is lossless and typically 24-bit, six channels with a 96KHz sampling rate. To rip the PCM data from a DVD-Audio disc is even harder. First, you need to install foobar2000 and then install the DVD-Audio Decoder component. Drag and drop the file called 'AUDIO_TS.IFO' in the AUDIO_TS directory of the DVD-Audio disc onto foobar2000. You can then either play the audio tracks or convert the individual tracks to WAV or FLAC by right-clicking each file and selecting 'Convert'.


DVD Decrypter
File Edit View Mode Tools Help
Source
[0:1:0] PLDS DVD+-RW DH-16ABS (R:)
Label: Mahler_06_NTSC
Region: 1, 2, 3, 4, 5, 6, 8 - RCE Protection: No
Copyright Protection System Type: None
Destination
D:\Mahler_06_NTSC\VIDEO_TS\
Capacity: 1,953,512,032 KB
Free Space: 180,400,380 KB
Input Stream Processing
Enable Stream Processing
0xE0 - Video - 720x480 (NTSC) / 16:9
0x81 - Audio - AC3 / 6ch
0x8A - Audio - DTS / 5ch
0xA0 - Audio - LPCM / 2ch
Stream: 0x8A - Audio
Direct Stream Copy Demux Raw
Ready
01:29:11.11 / 30 fps
6,193,520 KB

DVD Decrypter can rip audio tracks from DVD-Video discs.

For DVD-Audio discs, you need the DVD-Audio Decoder component of foobar2000. You can play or convert the tracks to WAV or FLAC.



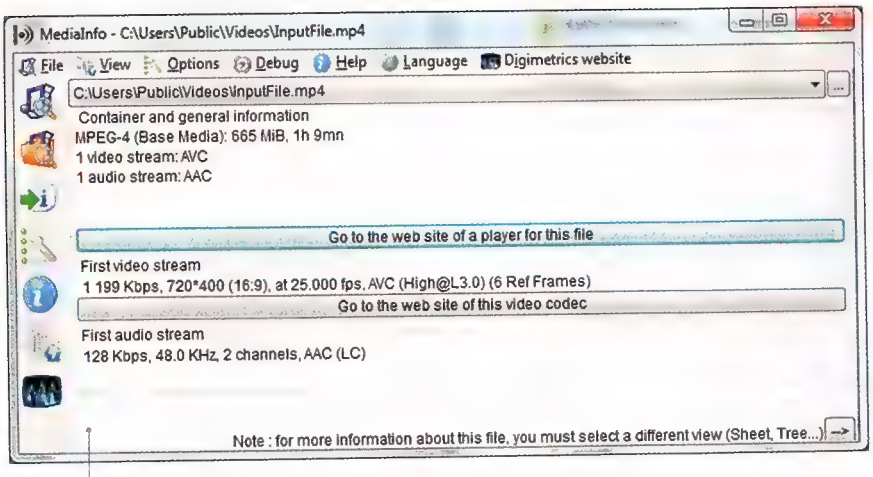
CONVERT DVD AUDIO TO CD

If you want to rip the video sound to play it back on your portable device or convert it to CD, then extract the PCM stereo soundtrack. Once extracted, you convert it to 44.1KHz format for later editing. High-quality sample rate conversion is available using r8brain (**www.voxengo.com/product/r8brain**). Simply specify the input and output .WAV files, choose 'Very high' quality and click 'Perform r8brain'. Always choose the highest quality for conversion. You're only going to convert each file once and it only takes five minutes or less, depending on the file size. You use audio editors like Audacity and Reaper, which we discussed last month, to slice up the converted audio into tracks and export them as individual files or as a CD image. Once exported, you can burn the CD or convert the files using the tools discussed later in this article.

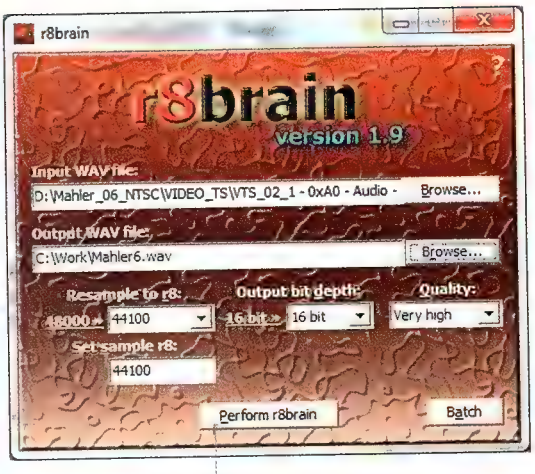
CONVERT SURROUND SOUND DVD AUDIO

There are many commercial programs to convert one audio format to another. However, for this article we'll concentrate on the excellent free tools that are available to convert and manipulate sound and video. In general, we prefer command line tools, as this allows us to script operations for bulk sound conversion. To convert the AC-3 or DTS soundtrack you've just ripped, you can use FFmpeg. This is an amazing open-source program for audio and video conversion (**ffmpeg.org**). You can get the static .EXE program for use under Windows at **ffmpeg.zeranoe.com/builds**. The files are distributed in a 7Z archive, so you'll need 7-Zip to extract them (**www.7-zip.org**).

FFmpeg can choose the output format based on the filename. To convert the audio to WAV format, start a


MediaInfo - C:\Users\Public\Videos\InputFile.mp4
File View Options Debug Help Language Digimetrics website
C:\Users\Public\Videos\InputFile.mp4
Container and general information
MPEG-4 (Base Media): 665 MiB, 1h 9mn
1 video stream: AVC
1 audio stream: AAC
Go to the web site of a player for this file
First video stream
1 199 Kbps, 720*400 (16:9), at 25.000 fps, AVC (High@L3.0) (6 Ref Frames)
Go to the web site of this video codec
First audio stream
128 Kbps, 48.0 KHz, 2 channels, AAC (LC)
Note : for more information about this file, you must select a different view (Sheet, Tree...)

You can extract audio from a video file with MediaInfo. Right-click a file and select 'MediaInfo'.



High-quality sample rate conversion is available using r8brain.

Command Prompt and use the following command line:

```
ffmpeg -i "C:\Work\InFile.AC3" "C:\Work\OutFile.wav"
```

Or

```
ffmpeg -i "C:\Work\InFile.DTS" "C:\Work\OutFile.wav"
```

Once converted, you may want to extract one or more mono or stereo .WAV files for examination or manipulation. The easiest way to do this is by using the free program, Wave Agent (**tinyurl.com/cqw8xde**). Once you've opened the multitrack .WAV file, you can split it into component parts. Below is a screenshot showing the surround sound file being split into four: front and rear stereo files, along with mono centre and LFE (low-frequency effect) files.

EXTRACT AUDIO FROM VIDEO FILES

FFmpeg can also extract audio from a video file. If you want to extract the audio without conversion, you first need to know what format it's in. You can do this with MediaInfo (**tinyurl.com/2bckk9**). Once installed, right-click any media file and select 'MediaInfo'. In this case, the audio codec is AAC (aka M4A). To extract the audio, use the following FFmpeg command:

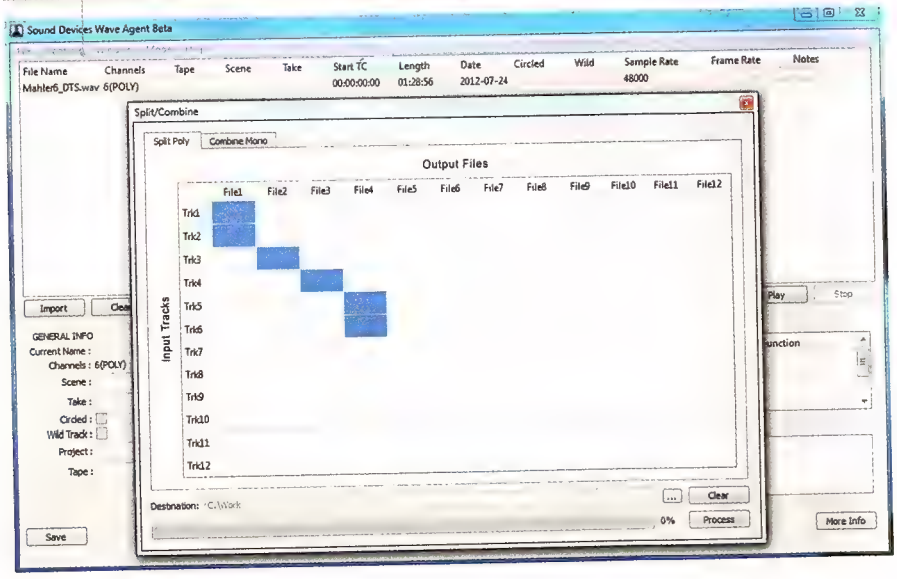
```
ffmpeg -i "C:\Work\InFile.mp4" -acodec copy -vn "C:\Work\OutFile.m4a"
```

FFmpeg can also copy video and audio from one container to another. If you have an .FLV file that you downloaded from YouTube, you can't play this file with Windows Media Player. However, you can convert it to mp4 format, which Windows Media Player can use, as follows:

```
ffmpeg -i "C:\Work\InFile.flv" -codec copy "C:\Work\OutFile.mp4"
```

There are many more uses for FFmpeg. The installation contains many help files that document all the conversion options.

You can extract files with the free program Wave Agent. Open the multitrack .WAV file and you can then split it into component parts.



CONVERT AUDIO FOR PC ARCHIVING & PLAYBACK

Audio is normally stored as stereo data in .WAV or .FLAC files. .WAV files are a PCM representation of the original digital audio data, while .FLAC files are lossless compressed files. Lossless means you can convert the .FLAC file back to .WAV and the original file will be recreated. FLAC is becoming the de facto standard for lossless audio files. Many audio sites allow you to purchase and download original recordings in FLAC format with quality better than you can purchase via CD. There are other forms of lossless audio, such as ALAC and WavPack. However, ALAC is a closed Apple format and FLAC has overtaken WavPack as the most popular open format.

You can convert WAV to FLAC with the FLAC converter (**tinyurl.com/yvy2f**). Typical use of FLAC is as follows:

```
flac -o "C:\Work\OutFile.flac" -V -5 "C:\Work\InFile.wav"
```

In this example, `-o` defines the output file, `-V` means verify the .FLAC file as it's being written and `-5` is the default for the speed and size of compressed file. The benefit of using `-6` or higher on file size is generally negligible.

To decode a .FLAC file back to .WAV, you use the option `-d` as follows:

```
flac -d -o "C:\Work\OutFile.wav" "C:\Work\InFile.flac"
```

Be warned that the resulting file may not be exactly the same as the original .WAV file! That file may have contained other chunks of data, such as PAD. FLAC will throw away these chunks by default when encoding and will only keep the DATA chunk. Later in this article we'll see how to check that the file has been encoded correctly.

CONVERT AUDIO FOR SMARTPHONE OR CAR PLAYERS

For lossy compressed audio, the common types are MP3, WMA and AAC (also known as M4A). MP3 is the original common format and is probably still the most widely supported on most hardware and software platforms.

WMA is Microsoft's answer to MP3 and it generally has better sound quality at the same

bit rate as MP3. AAC has been adopted by Apple for portable devices such as the iPod and iPad. It also has superior sound quality to MP3. However, as with WMA, these differences are generally only heard at bit rates of 128Kbps or less. If you're going to encode your audio at 256Kbps, it'll be impossible for most people to hear any difference, especially in a car or via inferior buds attached to an iPod.

You can convert .WAV files to .MP3 with the LAME converter (**lame1.buanzo.com.ar**). Here's an example:

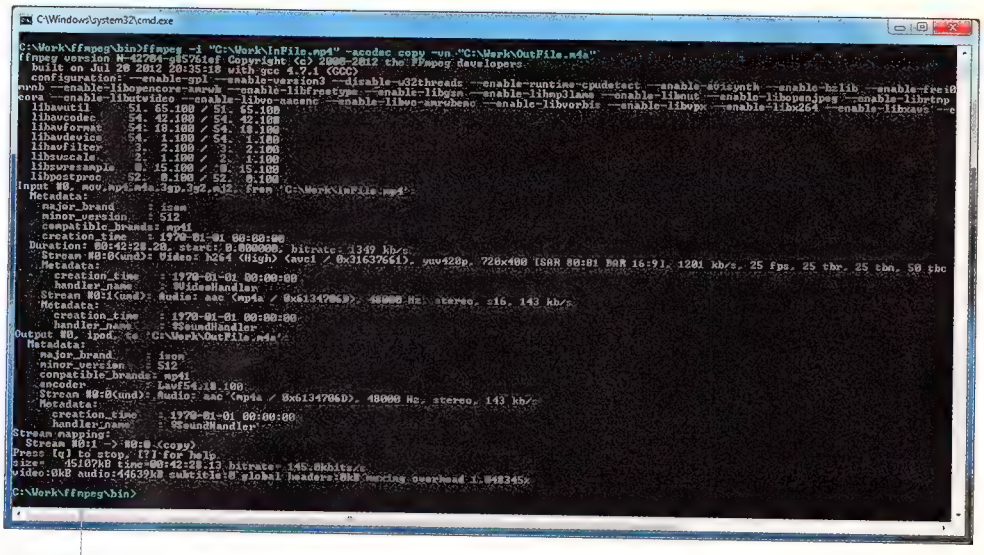
```
lame -b256 -h --disptime 10 --noreplaygain
--pad-id3v2-size 1024 "C:\Work\InFile.wav" "C:\
Work\OutFile.mp3"
```

The command line parameters are important here: `-b256` means constant bit rate 256Kbps. This works in all my devices except iPod and is high quality. You can use `-V2` instead for variable bit rate files, but some devices may not play these files.

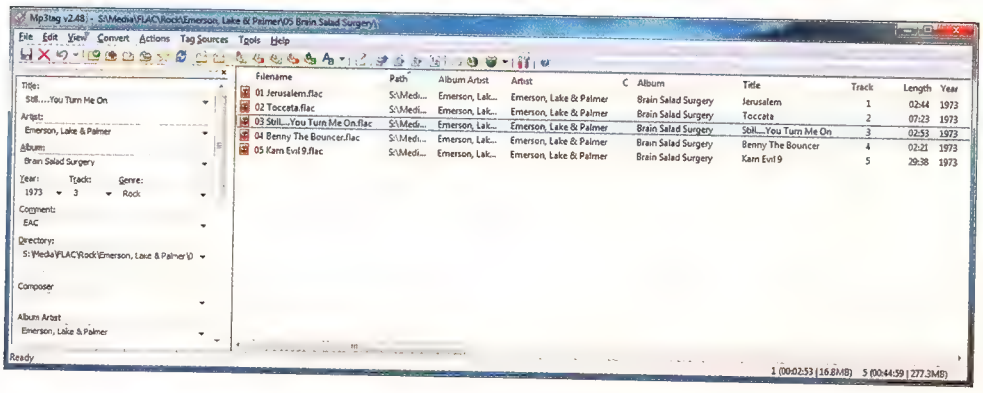
The `-h` part is the same as `-q 2` – recommended for high-quality conversion. `--disptime 10` will give you a progress update every 10 seconds, `--noreplaygain` will speed up processing at the expense of replaygain analysis and `--pad-id3v2-size 1024` means pad the MP3 with 1,024 blank bytes to allow for future tagging. If you forget this and later tag the MP3, the whole file will be rewritten, which is slow.

You can convert an .MP3 file back to .WAV or indeed any other audio file type like AAC using FFmpeg. However, since MP3 is a lossy form of compression, you'll lose quality. Always convert from WAV in preference.

You can't multitask MP3 conversion using a single instance of LAME. However, you can launch four .BAT files, each with LAME commands, at the same time and each .BAT file will use its own CPU. Running more than four isn't recommended, as this can make your hard drive slow to a crawl.



To convert audio to WAV format, and have FFmpeg rename the file, start a Command Prompt.


Mp3tag v2.48 - S:\Media\FLAC\Rock\Emerson, Lake & Palmer\05 Brain Salad Surgery\
File Edit View Convert Actions Tag Sources Tools Help
Filename
01 Jerusalem.flac
02 Toccata.flac
03 Still....You Turn Me On.flac
04 Benny The Bouncer.flac
05 Karn Evil 9.flac
Ready

The Mp3tag GUI is easy to use and you can copy and paste tags from .FLAC to .MP3 files.

CONVERT AUDIO FOR IPOD OR IPAD

The choice for your lossy format will be determined by your playback equipment. iPod won't play WMA files, but Windows plays . AAC files. Windows and most car players will play .MP3 files, although my iPod refuses to play many .MP3 files encoded at 256Kbps; it will play the .MP3 files encoded at 192Kbps, however. You should experiment to find a format that can be played by all your hardware and software. For maximum quality, always store the original audio as .FLAC files with tags and convert to MP3 and AAC as required.

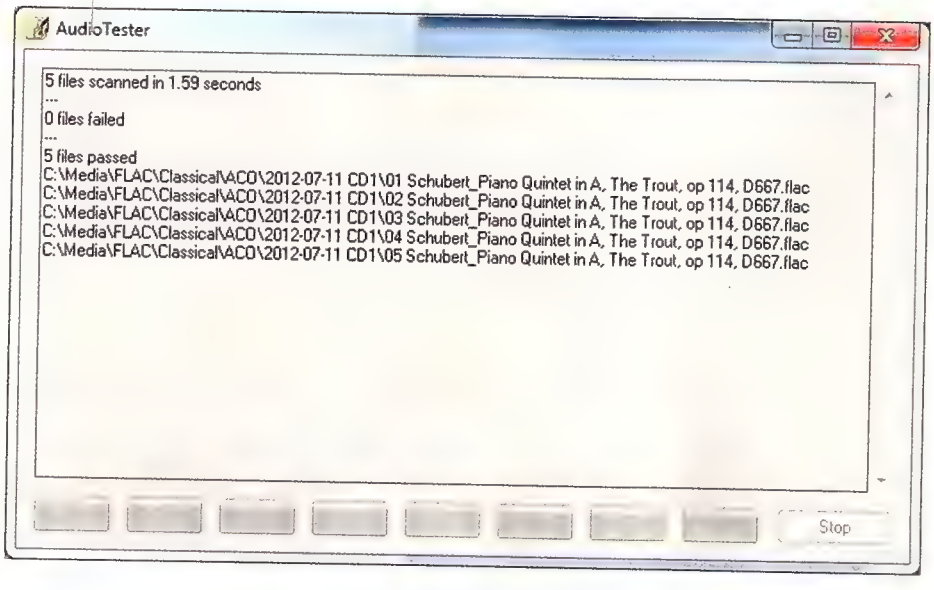
There are two ways to encode audio as AAC, apart from using iTunes. As we've seen, FFmpeg can convert from one audio format to another. Here's an example:

```
ffmpeg -i "C:\Work\InFile.wav" "C:\Work\
OutFile.m4a"
```

For maximum quality, you can use the Nero AAC Codec (**tinyurl.com/yea5omu**). The command line is as follows:

```
neroAacEnc -q 0.55 -if "C:\Work\InFile.wav " -of
"C:\Work\OutFile.m4a"
```

Nero also provides a command line program for tagging the resulting .AAC file.


AudioTester
5 files scanned in 1.59 seconds
---
0 files failed
---
5 files passed
C:\Media\FLAC\Classical\ACO\2012-07-11 CD1\01 Schubert_Piano Quintet in A, The Trout, op 114, D667.flac
C:\Media\FLAC\Classical\ACO\2012-07-11 CD1\02 Schubert_Piano Quintet in A, The Trout, op 114, D667.flac
C:\Media\FLAC\Classical\ACO\2012-07-11 CD1\03 Schubert_Piano Quintet in A, The Trout, op 114, D667.flac
C:\Media\FLAC\Classical\ACO\2012-07-11 CD1\04 Schubert_Piano Quintet in A, The Trout, op 114, D667.flac
C:\Media\FLAC\Classical\ACO\2012-07-11 CD1\05 Schubert_Piano Quintet in A, The Trout, op 114, D667.flac
Stop

Test converted audio with AudioTester. Drag files or folders onto the program and it will analyse them for errors.

TEST CONVERTED AUDIO

For those paranoid users like myself, there's a way to test that the resulting compressed files are without error. For this I use AudioTester (**tinyurl.com/cjorp**). You drag files or folders of MP3 and/or FLAC audio onto the program and it will analyse them for errors.

The program makes use of multiple CPUs and can also be launched from the command line.

TAG CONVERTED AUDIO FILES

You can do limited tagging of .FLAC files using 'Tag.exe', which comes as part of the FLAC download package. You can use AtomicParsley (**tinyurl.com/8nz7vxz**) to tag .AAC files created by FFmpeg. However, all my tagging is done via Mp3tag (**www.mp3tag.de/en**) and AudioGenie (**tinyurl.com/9oyy26u**).

The Mp3tag GUI is easy to use and you can copy and paste tags from, say, .FLAC to .MP3 files. For complicated tagging needs, you can use the AudioGenie .DLL, but this means you have to program your own interface in something like VB.NET.

CD IMAGE CONVERSION

It's common to keep a master copy of a ripped CD in CUE/WAV format so it can be burned back to CD if the original gets damaged.

Exact Audio Copy (**www.exactaudiocopy.de**) will rip a CD as CUE/WAV. Once ripped, it can be burned back to CD using ImgBurn (**www.imgburn.com**). The CUE/WAV file can also be played back using foobar2000. However, it's common to cut up the single .WAV file into tracks using a program like CUE/WAV Extract Utility (**tinyurl.com/8qlmgln**) or CUETools (**tinyurl.com/44p5ebq**).

Using the former, you simply drag and drop .CUE files and click 'Extract'. Be warned that the CUE/WAV Extract Utility will honour the pregap information – a pregap is the 'countdown' of silence between certain tracks. Here's an example from a typical CUE sheet:

```
TRACK 03 AUDIO
INDEX 01 05:00:21
TRACK 04 AUDIO
INDEX 00 07:29:00
INDEX 01 07:31:00
```

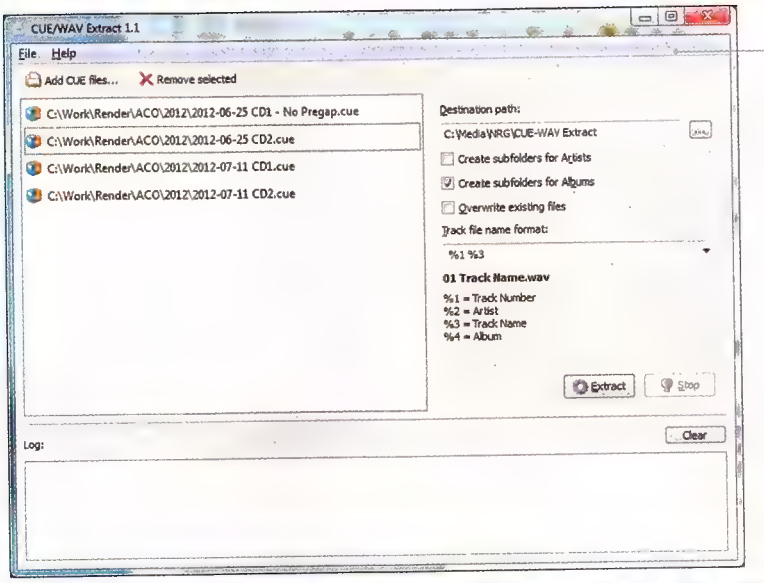
Track 04 has two seconds of silence before it starts. Normally, you'll want to append this silence to Track 03 when doing continuous playback. For this reason, you have to delete the lines with `INDEX 00` or use CUETools to specify that the silence is appended to the previous track.

If you use Reaper to create your own CDs, it creates CUE/BIN files, rather than CUE/WAV files. To extract the tracks from a CUE/BIN file, you can use AnyToISO (**tinyurl.com/yjgskxo**). Simply open the .BIN file, choose the output directory and click 'Extract'.

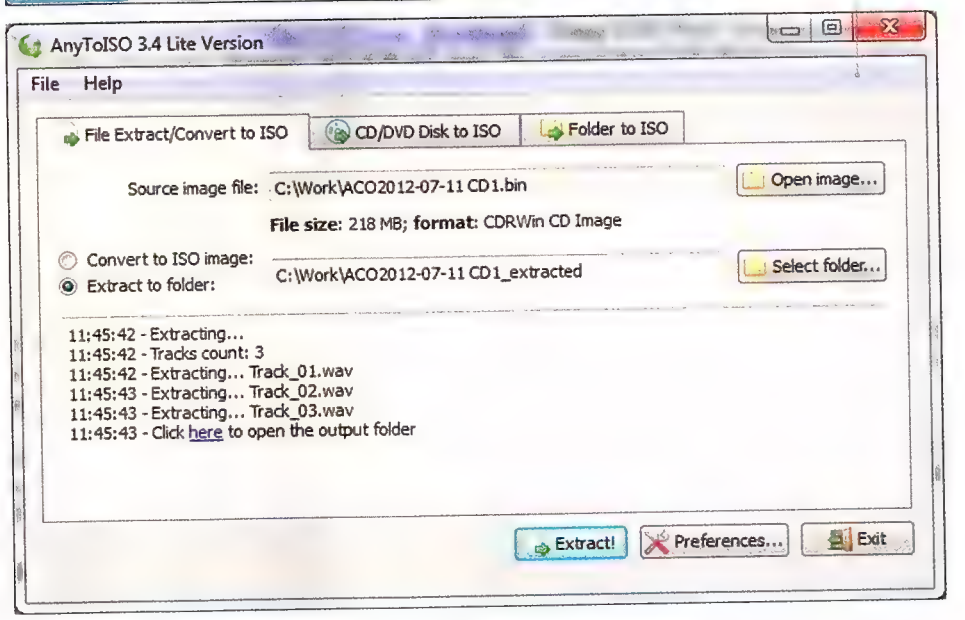
SHNTOOL

Another option for splitting CUE/WAV files is to use shntool (**tinyurl.com/2e794**). This program is a mandatory part of your toolbox. Firstly, it can carve up the CUE/WAV file with the following command line:

```
shntool split -d "C:\Work\OutDirectory" -f "C:\Work\Input.cue" "C:\Work\Input.wav" -t "%n Track"
```



You can cut up a single .WAV file into tracks using CUE/WAV Extract Utility. Simply drag and drop .CUE files and click 'Extract'.



To extract tracks from a CUE/BIN file, try AnyToISO. Open the .BIN file, choose the output directory and click 'Extract'.

This will produce files called '01 Track.wav', '02 Track.wav', '03 Track.wav' and so on. You can also join the files all back together using this command:

```
shntool join -d "C:\Work" "C:\Work\OutDirectory\*.wav" -a "joined"
```

This will create a file called 'C:\Work\joined.wav'. You can even create a CUE sheet from the original .WAV files so you can burn 'joined.wav' to CD:

```
shntool cue "C:\Work\OutDirectory\*.wav" > "C:\Work\joined.cue"
```

Another great feature of shntool is the ability to compare two .WAV files and report if they're the same. If you put 'flac.exe' in the same directory, you can also compare a .FLAC file and the associated .WAV file. The utility only compares the DATA chunk in the .WAV file, so it doesn't care if other chunks like PAD have been removed in the .FLAC file. Here's the command line:

```
shntool cmp "C:\Work\InFile.wav" "C:\Work\InFile.flac"
```

Finally, if you want to trim the silence from the end of a WAV file, you can do this using shntool, like this:

```
shntool trim -d "C:\Work\NewDirectory" "C:\Work\OutDirectory\*.wav" -e -z "" "
```

CONCLUSION

In this month's masterclass we've covered the most useful tools for ripping and converting DVD and CD audio.

In the next month's article, we'll cover the best freeware audio player for Windows and ways the sound can be enhanced during playback. Stay tuned!

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TOP TIPS FOR SURVIVING CHERNARUS

PLAY SOME ARMA II FIRST.
If, like us, you've grabbed *Arma II: Combined Ops* just to play *DayZ*, it's worth firing it up and playing a few missions, if only to familiarise yourself with the game systems. There'd be nothing worse than being trapped in the Cherno supermarket by Zeds and not being able to pick up the Makarov on the ground in front of you.

FIGURE OUT WHERE YOU ARE
Your initial location flashes up when you load the game. Don't miss it – unless you've played the game a while and know areas by sight, it's the only indicator of where you are.

DON'T LINGER ON THE COAST
You'll generally spawn with a small coastal town or one of the larger cities close by. Spend a few minutes searching for the basics – food, drink, weapons and tools – then head into the tree lines. While the major cities are a great place to gear up quickly, they're also a hotbed of Bandit activity.

SLOW & STEADY
When scouting, moving or navigating populated areas, especially where Zeds are concerned, don't be scared to crawl. It's much slower going, but it'll keep you out of trouble most of the time. If you need to run, crouch-run. It's much quieter and will attract less attention.

STAY OFF THE MAIN ROADS
They're way too exposed and you're just making yourself a pretty target for snipers. If you're using the road to navigate, follow it from a distance in the tree line.

TRUST IS EARNED
We've lost count of the number of times we've encountered another player who's shouted "friendly" over the chat, only to then be shot by them once we've let our guard down.

BARNS & DEER STANDS
Two locations that are more often than not isolated and ideal for pillage. Barns are ideal for finding tools, food, bandages, water and some weapons, while deer stands tend to yield higher-end military-grade weapons.

HELP PEOPLE
Taking down Zeds, chasing someone and then bandaging them up and sending them on their way with a can of beans is a wonderful feeling.

DON'T SHOOT ME
Seriously. Please don't shoot at me; I don't want to have to kill you.

DayZ

My gunshots bring all the Zeds to the yard. And they're like... urghghghghrhghghghr.

PC

@ www.dayzmod.com

$ DayZ mod, free; *Arma II: Combined Ops* (required for install), US$29.99 (Steam)

Wow I've just realised that in the 20 years or so that *APC* has been on the shelves, this is the first time a mod has ever been featured. Not because of any quality concerns regarding user-generated content, but more because there are often so many games on the horizon that they fall down the priority list. But there's something so exciting about the varied and emergent gameplay of *DayZ* that we couldn't resist.

DayZ is a zombie-themed survival mod for the excellent military simulator/shooter *Arma II* and its expansion, *Operation Arrowhead*. These games are famous for their realistic weaponry, ballistics physics and health/attrition systems.

The game takes place in the fictional Soviet county of Chernarus, a sprawling 225km² patch of rolling countryside complete with cities, small towns and... even more rolling countryside. Players spawn in a random location somewhere along the southern or eastern shoreline with nothing more than an empty backpack, a torch, a single bandage and good intentions for a long healthy life. The rest is up to you, but if you follow the basic rules of zombie survival and find food, water and weapons, you should do reasonably well.

The first tough lesson we learned was that the game genuinely doesn't care about us; it's completely unlike other shooters or survival games that have a focus on you as a main character progressing though a story of sorts, complete with high-five-ing bearded dudes at the end of each mission.

There may be up to 50 players on the same server as you, but unless you can trust them with your life, you're completely alone. The game doesn't care where you are or if you're OK. It doesn't care that you're thinking about killing a man for his shooter and beans or that you've broken your leg and are dying of starvation somewhere deep in the woods.

Players should expect to – and will – die a lot through both inexperience and misadventure. Sure, you'll spend the first few spawns seeing just how long you can survive, but after that there's some fun to be had in Chernarus as well.

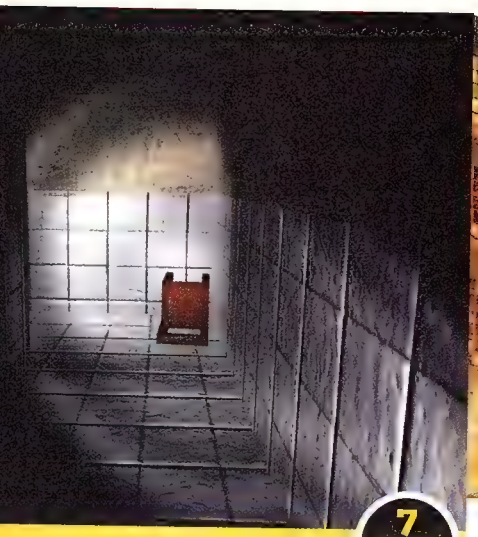
The whole idea of the game is to survive this terrible, unforgiving landscape, its inhabitants and other survivors. To run, hide, crawl, scrimp, steal, forage and kill to gain the game's staples of food and water, which more often than not are only found in and around dwellings where the zombies (the games only NPCs) shamble. And then crawl, run and hide some more until you see another survivor just like you. Do you announce yourself as friendly to other survivors, kiss your humanity and open fire, or run and hide? The tension *DayZ* builds is amazing.

At the time of writing it was announced that *DayZ* will be clipping its *Arma* tethers and moving to a standalone product similar to *Minecraft*; a long-playable beta phase with regular content updates and tweaks. It's an exciting time to be a PC gamer.

Troy Coleman

✔ Highly addictive open-world survival horror with almost limitless play styles.
✖ Awful inventory and item interaction systems, annoying bug inherited through the *Arma II* engine.

10/10



7/10

SLENDER

He's coming, he's coming, he's coming, he's coming.

@ slendergame.com
$ Free
✔ Free, guaranteed to scare the pants off you.
✖ Not a great deal of replayability.

MAC • PC

The popular internet phenomenon birthed in the forums of web site **somethingawful.com**, Slender Man has crept beyond the whispers of the night and onto our computer screens. The latest indie horror PC game, *Slender* is designed to be played alone in a dark room late at night and scare the absolute crap out of you.

Set in the first-person perspective, the concept of the game is simple: with no sense of direction and only the sound of nature and your heartbeat to keep you company, your only goal is to survive long enough to collect all eight notes before falling victim to the faceless entity, Slender Man.

As you cluelessly wander around the forest you catch glimpses of the Slender Man hot on your trail. This is where the game becomes intensely frightening, knowing you're being helplessly hunted...

As a free game that's designed by one man as coding practise, it's captured the elements of horror movies brilliantly: the fear of looking back, the rising intensity of the audio and the horror movie-ish, smoggy forest atmosphere. It does eventually turn repetitive, but it's definitely worth taking a look if you're into the genre.

Daniel Cheng

Tom Clancy's Ghost Recon: Future Soldier

A Tango's on my six!

PC

@ www.ghostrecon.com $ PC, $70; consoles, $90

The fifth instalment in the *Tom Clancy*-themed *Ghost Recon* series. In classic Tom Clancy style, the campaign takes place in a number of African and European hostility hotspots and ticks off all the requisite checkboxes for the genre. Stolen nukes, check. Weapon trafficking, check. Rogue spec ops operatives... well, you get the idea. It's just lucky that the third-person, cover-based tactical gunplay is such a blast. If you're new to the series, this isn't your typical run-and-gun shooter; instead, it encourages players to use tactics and teamwork to clear objectives without attracting the attention of the baddies.

While you spend a fair amount of time scoping out the next encounter area, making plans and assigning synchronised kill orders for your bros, there's very little of the exhausting tedium that sometimes came out of earlier *Tom Clancy* games, so it maintains a constant feeling of progression through great combat and tactics balancing. There's always something to do and a new way to approach a situation, and that's largely thanks to the broad range of high-tech gadgets and customisable weaponry at your disposal. Players are able to customise triggers, optics, barrels, magazines, attachments and even gas systems. The options are exhausting, but really compound that elite soldier immersion most other shooters miss.

The main campaign can also be tackled with four-player co-op and while it's great in theory, the reality is that unless you can scrape together an already experienced team who can follow basic instruction, it can be an exercise in frustration. When it all becomes too much, take your 'team' into the competitive arena and kick their arses in a deathmatch or two.

Troy Coleman

✔ Solid cover-based shooter jam-packed with fun weapons and gadgets.
✖ Takes itself a little too seriously, annoying AI bugs.

8/10

Darksiders II

It's monstrous but good.

PC

@ www.darksiders.com $ US$49.95

Darksiders II may be a bit of a Frankenstein's monster, but it's a surprisingly coherent and sturdily built one. Successfully grafting together bits and pieces of other titles is something many games attempt, but few are really successful at.

The developers at Texas-based Vigil Games have clearly been honing their sewing skills, though. With this sequel to their 2010 hit, they've successfully stitched together the head and brain from Nintendo's *Zelda*, with the torso (and cojones) of *God of War* and the agile limbs of *Prince of Persia*. And what's risen from the dev's vat is surprisingly non-ogresque; an action game where you play Death – one of the four horsemen of the apocalypse – with a heavy emphasis on puzzle-centric dungeons and boss battles (with most requiring a unique strategy), combined with button-mashing, combo-heavy combat and a solid jolt of wall climbing and acrobatics.

What it lacks in wit and sophistication it makes up for with its clean and polished gameplay. Vigil Games hasn't just sprayed this monster clean with a hose; it's scrubbed every nook, cranny and seam raw with Dettol and a stiff wire brush. The result is that this is a big, hulking game, with lots of roving around and roaming over large outdoor areas before delving into dungeons and slickly chopping and/or bashing enemies. However, the combat isn't too challenging, provided you dutifully upgrade your gear and abilities as you go.

While its design is never quite inspired in any of the areas it copies, *Darksiders II* is undeniably well put together. If you're a fan of any of its constituent parts, it's well worth having a wrestle with.

Dan Gardiner

✔ Successfully combines multiple genres into a compelling whole.
✖ A little bland and generic at times.

8/10

Tony Hawk's Pro Skater HD

Going back to skate school somewhat sucks.

360

@ tinyurl.com/7kffnb7 $ 1,200 MS Points

The last couple of *Tony Hawk* games were really pretty terrible offerings, so a return to the series' beginning with *Pro Skater HD* and a refit of levels from the first two *Tony Hawk Pro Skater* games seems like a very sensible idea.

In some ways it is – the controls of those games were sharp and they've got a warm, nostalgic appearance to them, even with high-definition makeovers. The visuals look very good, right down to a visibly older Tony himself; however, annoyingly there's no create-a-skater option anymore – the best you can do is skate with your wacky-looking Xbox Live avatar.

Looking good is nice, but there's more to rolling around the skate park than rocking a fauxhawk (pun completely intended) and *Tony Hawk Pro Skater HD* falters in a couple of key areas. The Xbox 360's analogue controller oddly lacks the digital precision of the original, making some tricks irritatingly less repeatable than they should be.

The original game's heavy – yet consistent – physics have been updated, but at times it's like the code is rejecting its new body and leaves things in an odd state. It's sometimes comical when you stack, only to see Tony float up in the air like he's helium-filled, but it's just plain annoying when a perfect trick suddenly ends with facial gravel rash.

That issue tied into an odd selection of only a mere seven levels – there are some classics like School, along with some less-than-stellar inclusions – makes for an overall package that isn't really going to grab new players or fully satisfy the nostalgic urges of classic-series *Tony Hawk* fans either.

Alex Kidman

- ✓ HD update looks slick, better than the last couple of games.
- ✗ Controls not precise enough, wacky physics.

7/10

LITTLEBIGPLANET PS VITA

More Sackboy platforming... did we really need it?

- @ www.littlebigplanet.com
- $ $55
- ✓ Some nice Vita touch functionality.
- ✗ Feels too much like ground we've covered before, online connection required for all aspects of play.

PS VITA

You've had just about as much cute as you can handle through the already three major LBP releases for PS3 and PSP, and probably groaned and threw up in your mouth a little just by reading the headline. Honestly, we felt the same way until we started playing and realised we were smiling. And worse, giggling! The gameplay is essentially the same: traverse your Sack through side-scrolling platforms, collecting stuff and solving a handful of puzzles along the way. The Vita controls suit the gameplay quite well with players needing to push, click and drag objects on the front touchscreen as well, as prod and touch things on the back. At times it does feel like you need another hand or at the very least a couple more fingers, but it does add a little more interest to what feels like a whole heap of platforming ground we've already covered. Luckily Sackboy, his world and the PS Vita's functionality inject just enough adorability and quirk to keep us hanging on. The only downside for us was a requirement for an internet connection. While that's not an issue for us 3G-enabled users, we do feel for commuters with the Wi-Fi-only models wishing to settle in for some cute on the way to the office.

Troy Coleman

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SIMON CHESTER

IT'S GEEK-MEETS-NERD IN THIS KNOWLEDGE LOVE-FEST.

PLANT CONTROL IS THE NEW KINECT

Not a day goes by where I haven't looked at the potted blue throatwort (Trachelium caeruleum) sitting on my desk and thought: "Why am I using this mouse when a perfectly good plant sits right in front of me?" Not a day. Lucky for me, Disney has my back. Yes, experts have created a method of controlling an electronic device, such as a computer or electronic instrument, by simply touching a plant.

Dubbed 'Botanicus Interacticus', the system uses an electrode placed in the soil to gently electrify the plant body and using Swept Frequency Capacitive Sensing (SFCS) technology, it is then able to determine where on its body is being touched, as well as the nature of the touching – like a stroke, a tap, or a hover. The idea, of course, is to turn more aesthetically pleasing objects into controllers for remote devices, such as touching the plant to answer a hidden speaker phone.

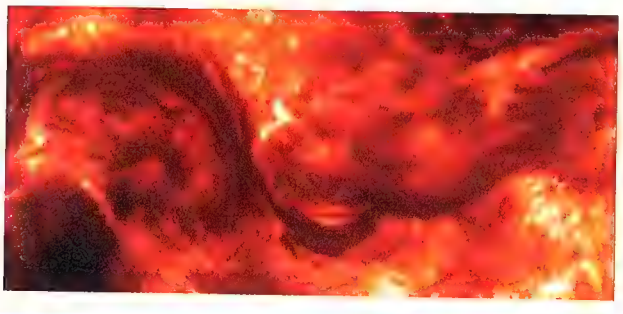
CLEAREST IMAGES EVER TAKEN OF THE SUN

A telescope launched aboard a NASA sounding rocket back in July has captured the highest-res images ever taken of the sun's million-degree atmosphere, called the corona.

Known as the High Resolution Coronal Imager (HI-C), the 210kg, 3m long telescope took 165 'extreme ultraviolet' images of the corona during its 620-second flight. The HI-C focused on a large active region on the sun, with some images revealing the dynamic structure of the solar atmosphere in fine detail.

The previous best sun snapper, the Atmospheric Imaging Assembly (AIA) instrument, flying aboard NASA's Solar Dynamics Observatory, can see structures on the sun's surface with clarity of approximately 1,000km across, and observes the sun in 10 wavelengths of light. HI-C observed features down to roughly 135 miles, but observes the sun in just one wavelength.

The clarity of the images has been said to help scientists better understand the behaviour of the solar atmosphere and its impacts on Earth's space environment, but I think they just look really, really cool. Or hot. Whatever, they look amazing.



TWITTER PREDICTS PERSONAL ILLNESS 8 DAYS IN ADVANCE

Researchers at the University of Rochester in New York have analysed a bunch of location-tagged tweets – 4.4 million of them from 630,000 users in New York City – to locate hotspots of ill health and then successfully predict which users will soon come down ill – with around 90% accuracy up to eight days in advance.

For this to work, they had to first figure out a way for their bot to differentiate tweets like 'sick of all the hipsters here' or 'fully sick, bra' from ones where people are complaining about being *actually* sick. They then match up people's regular movements to areas of known illness, leading to the accurate predictions.

Of course, the system can only highlight areas filled with sick, whingeing Twitter users, and rarely do said people also tweet their symptoms, so actually distinguishing disease type and seriousness isn't possible.

GIGABYTE™

GIGABYTE recommends Windows® 7.

P2542 Blu-ray Gaming Notebook

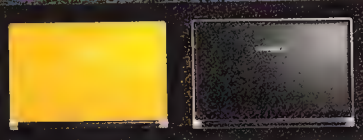
15.6" Gaming Graphics NVIDIA® GeForce® GTX 660M GDDR5 2GB

Unleash the Fury

Your PC, simplified.

Windows 7

Intel Core i7 | Windows 7 | NVIDIA GeForce | Full HD 1080 | Blu-ray Disc | THX TruStudio PRO



ALTECH COMPUTERS

NSW
- ARC Computers — arc.com.au
- Capitol Computers — capitolcomputer.com.au
- J&W Computers — jw.com.au
- Octagon International — octagoninternational.com
- Online Centre — onlinecomputer.com.au
- Cyber Planet — cyberplanet.com.au

TAS
- JTC Tasmania — jtctasmania.com.au

WA
- Austin Computers — austin.net.au
- Enable Technology — enabletech.com.au

VIC
- Centre.Com Sunshine — centrecom.com.au
- Computers & Parts Land — cpl.net.au
- PC Case Gear — pccasegear.com
- Scorpion Technology — scorptec.com.au

QLD
- Computer Alliance Pty Ltd — computeralliance.com.au
- Computer Function Pty Ltd — computerfunction.com.au
- Game Dude — gamedude.com.au

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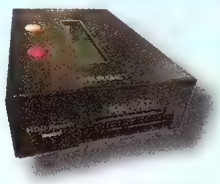

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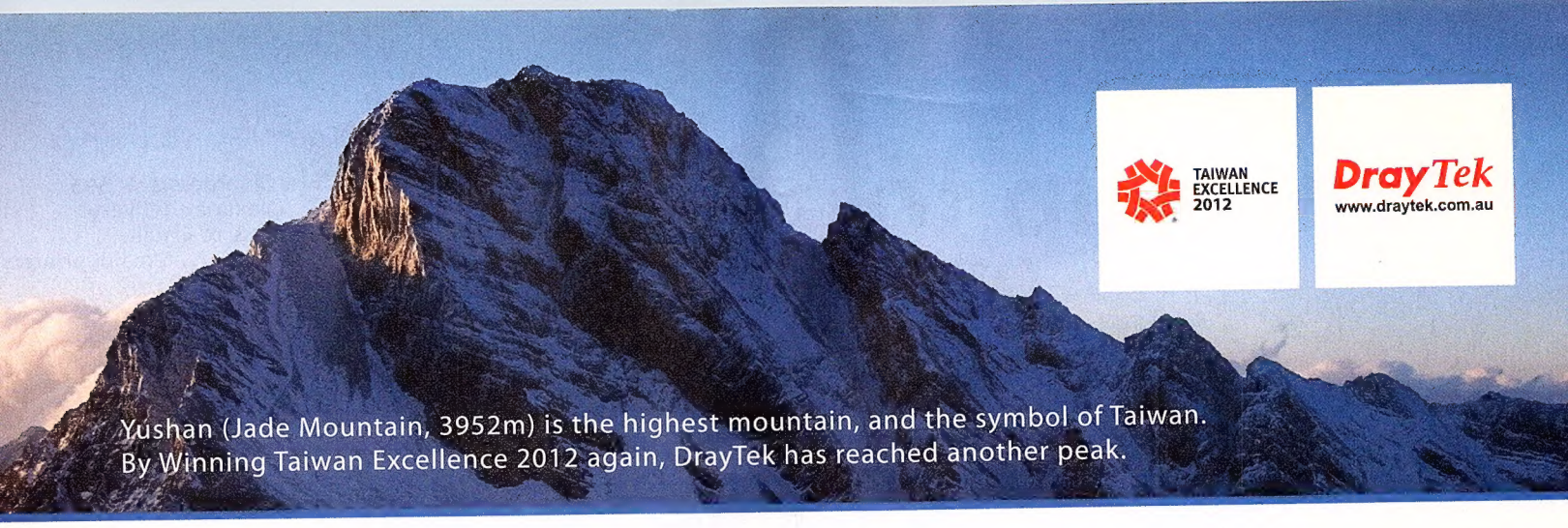
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Vigor2920 series

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- 32 x VPN tunnels with 3DES hardware accelerator
- QoS (Layer 2&3, 802.1p & TOS/DCSP) for prioritizing video, voice, online game and data traffic
- Object-based SPI Firewall with DoS/DDoS defence, Web Content Filter, Content Security Management (CSM) for latest IM/P2P software; VLAN; Management Tools
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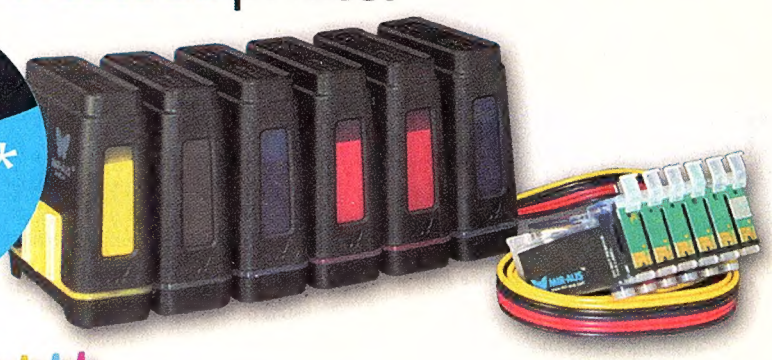

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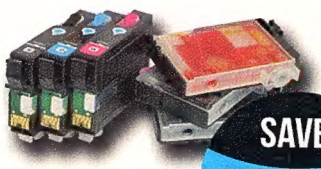

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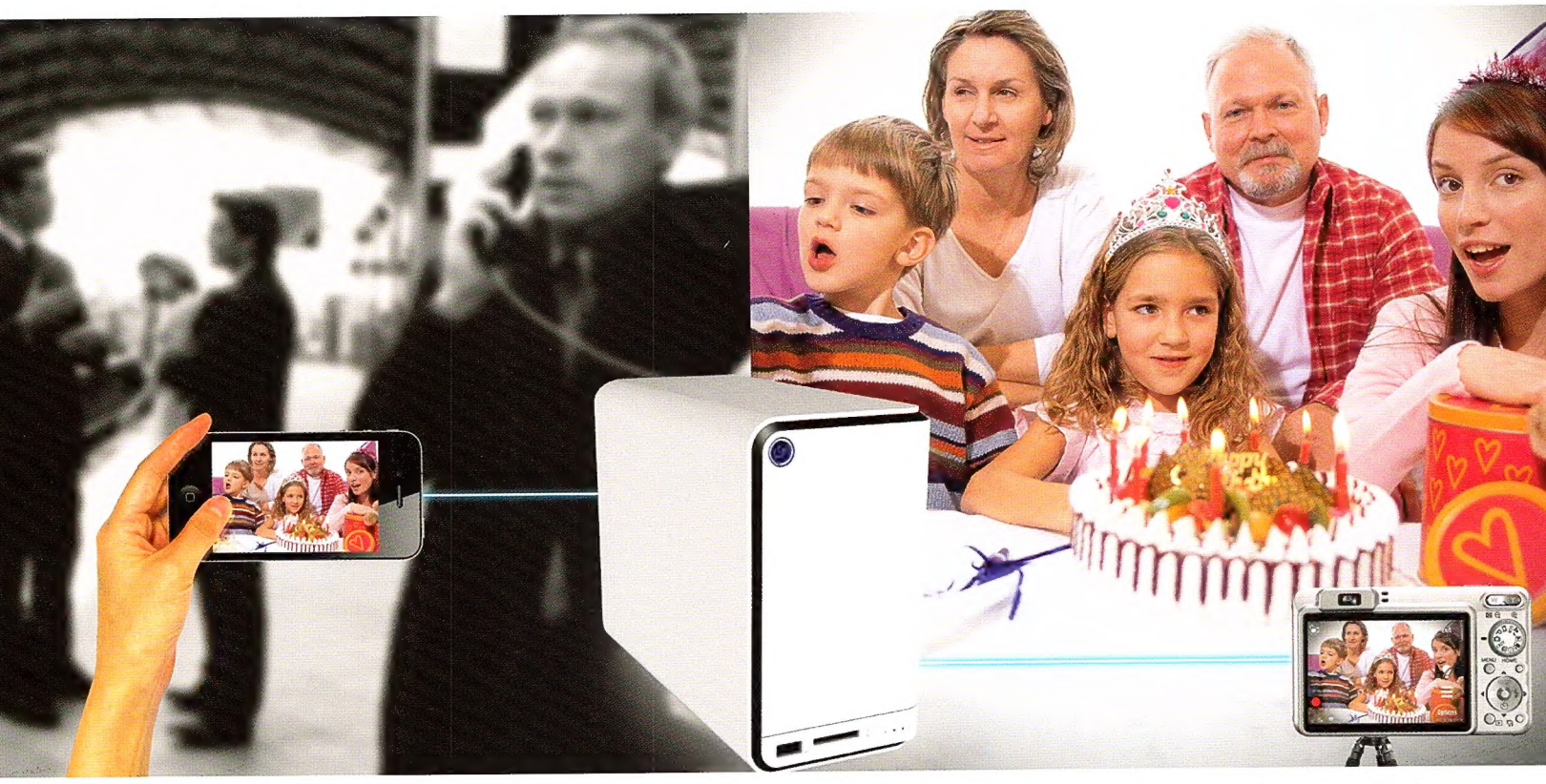

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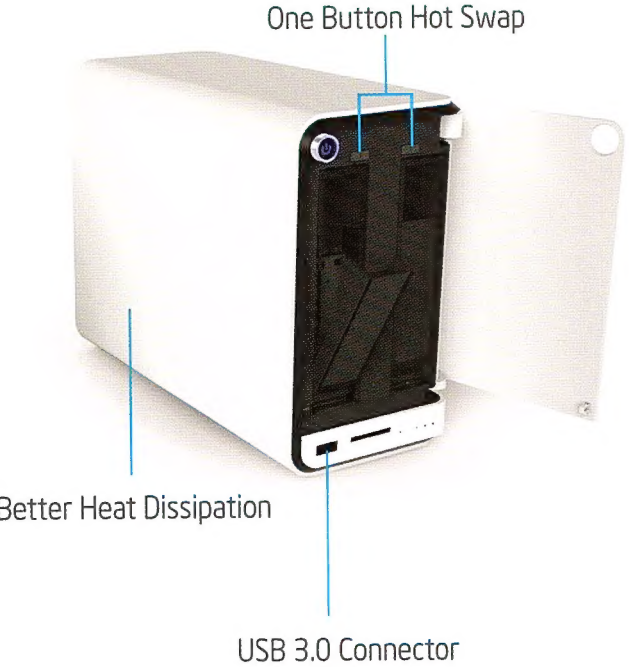

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